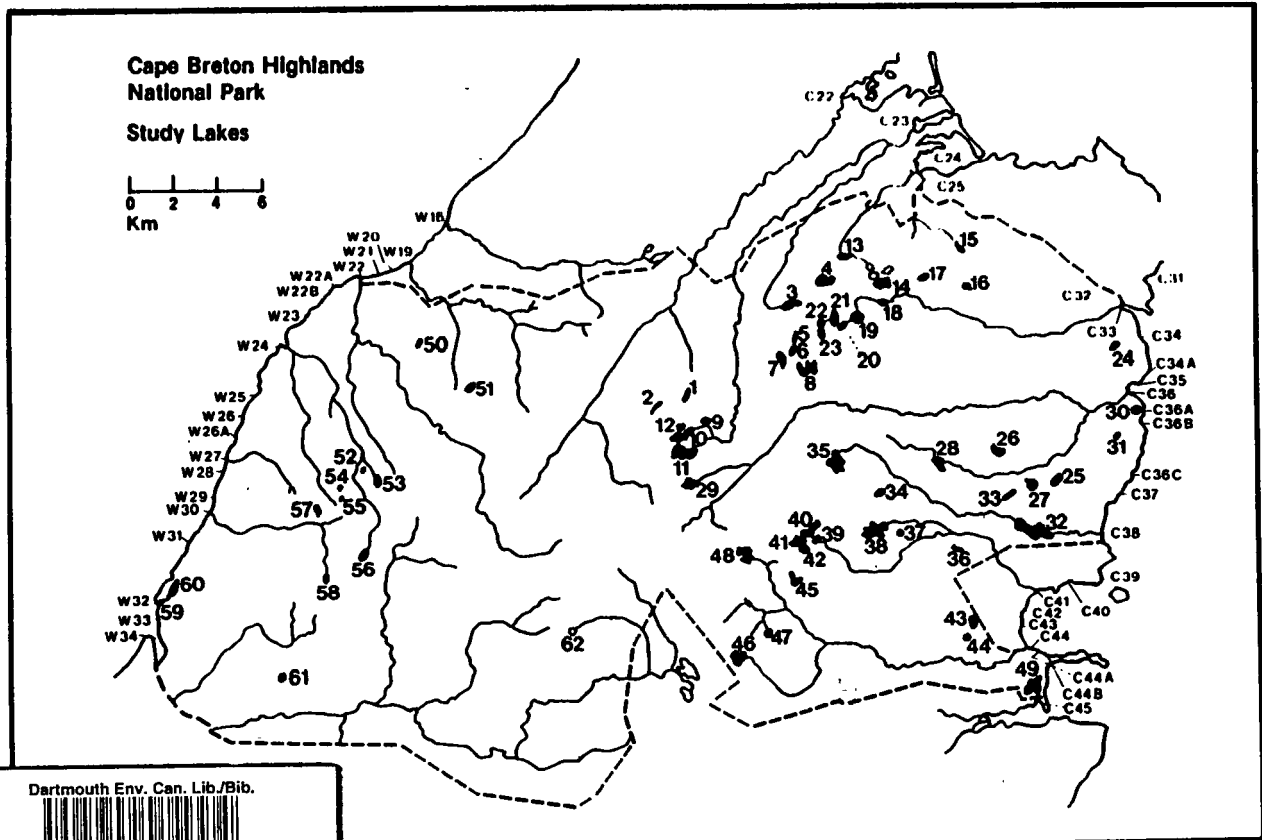


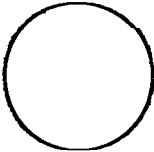
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 Atlantic Region

1978

Aquatic Resources Inventory Part 2

Lak M rphometry

by
 Joseph Kerekes, Peter
 Schwinghamer, and
 Richard Scott

Aquatic Resources Inventory
Cape Breton Highlands National Park
Nova Scotia

Part 2

Lake Morphometry

by

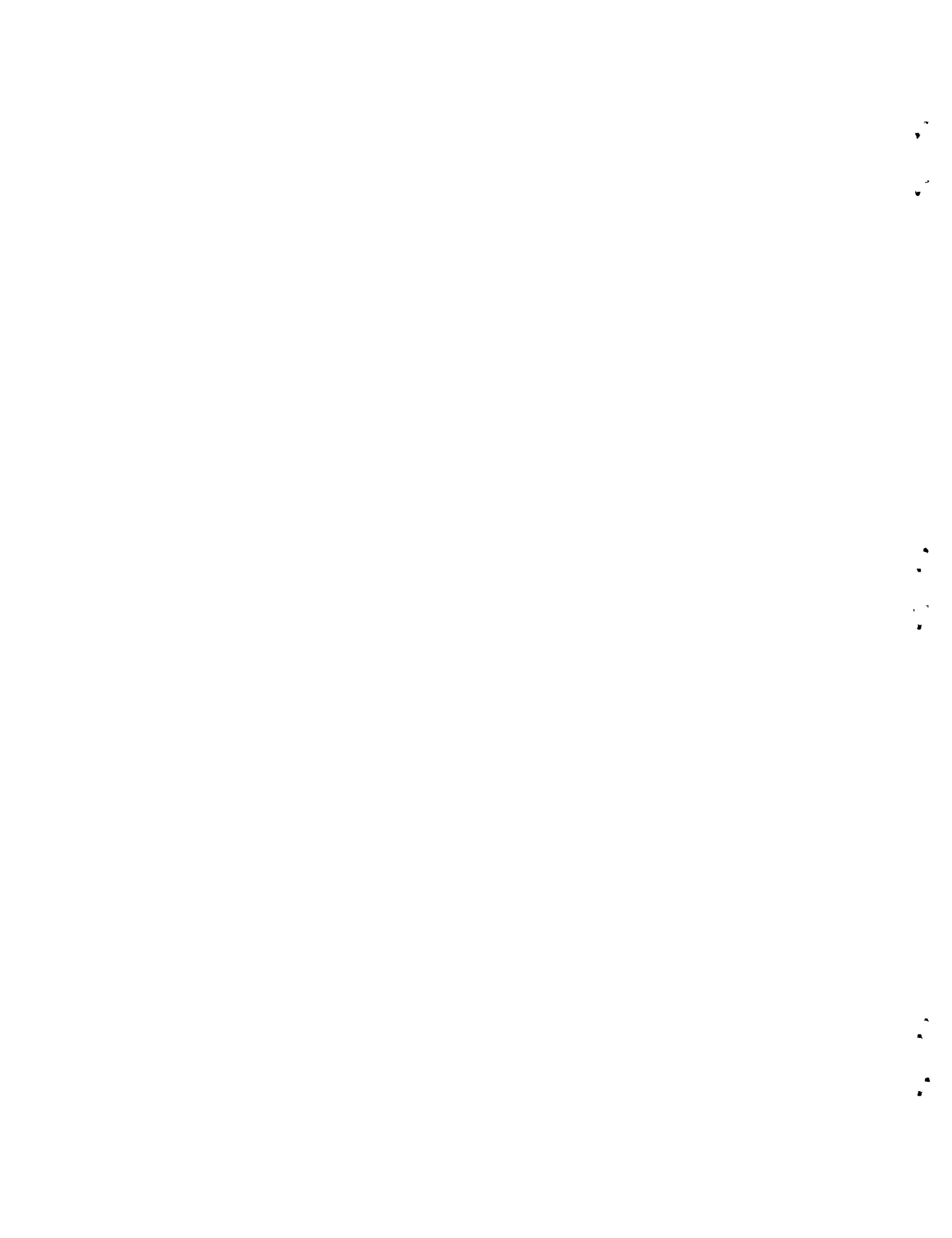
Joseph Kerekes

Peter Schwinghamer

Richard Scott

1978

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ABSTRACT

Morphometric and hydrologic features, morphometric indices, bathymetric maps, area and volume depth curves are presented for twenty-five lakes in Cape Breton Highlands National Park, Nova Scotia.

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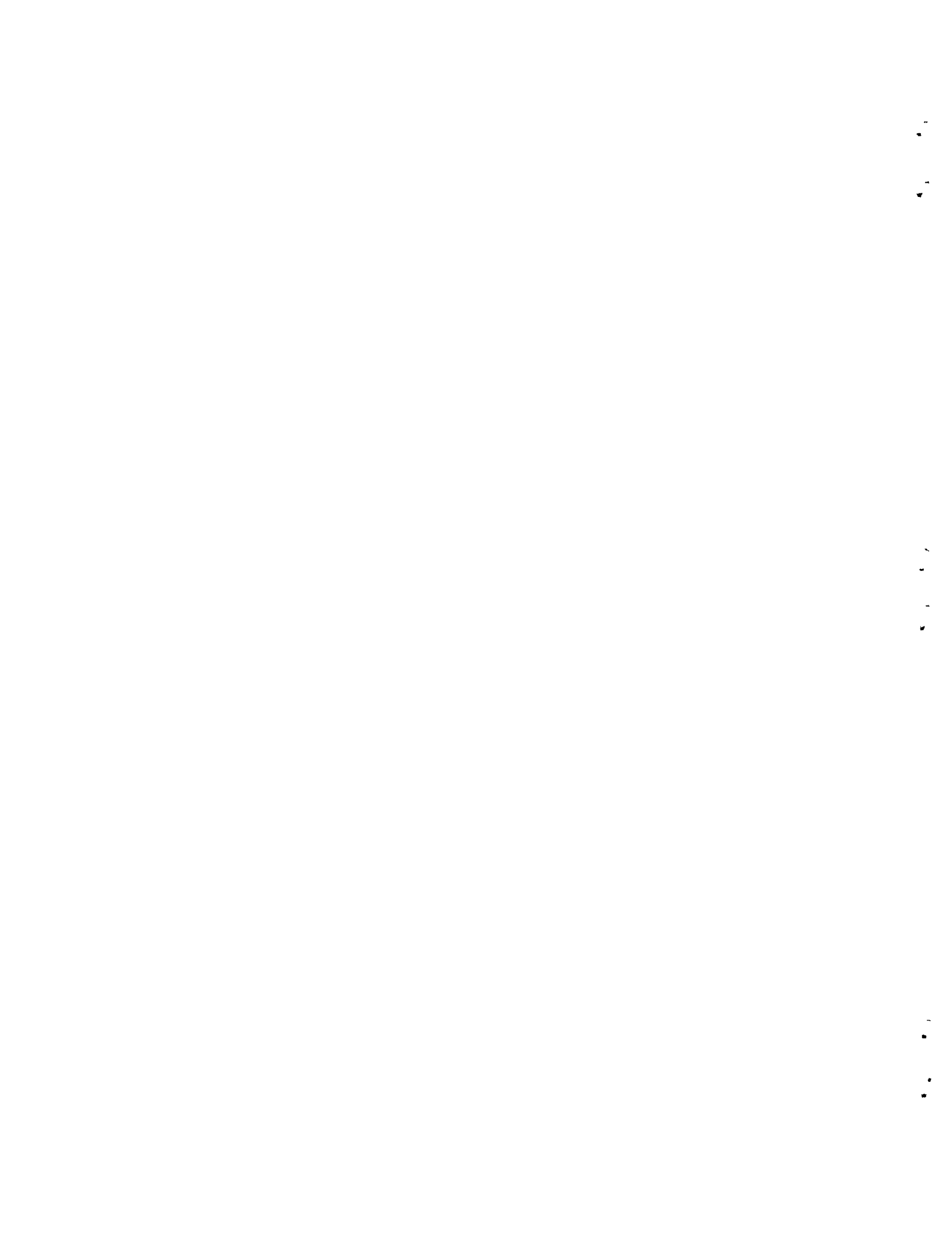
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INTRODUCTION

The objective of the Aquatic Resources Inventory carried out by the Canadian Wildlife Service in Cape Breton Highlands National Park is to provide reliable baseline data on the freshwater environment in the Park. Because the number of lakes in the Park is large and access to many is difficult, we felt that the most information could be gained by investigating a representative cross section of lakes. To this end, morphometric and hydrologic data were gathered from as many different lakes as possible.

Part I of the Aquatic Resources Inventory of Cape Breton Highlands National Park (Kerekes et al., 1976) provided the starting point for the investigations by cataloguing the freshwater features of the Park. The present report builds from that base by describing the morphometric features of a wide range of the lakes, from small highland ponds such as Benjie's Lake and Fishing Cove Lake, to Warren Lake, the largest and deepest lake in the Park. Morphometric features such as area, volume, depth shorelength are of fundamental importance in gaining an understanding of a lake. Factors determined by a lake's location such as distance from the sea, elevation or position in the drainage system can also have an important bearing on the limnological conditions.

Limnologists now recognize that information on the hydrological parameters of lakes is also of primary importance for lake management. These parameters strongly affect the qualitative and quantitative characteristics of the physical, chemical and biological environment of lakes. Thus, this report includes estimates of flushing rates, its inverse relationship to water retention time, and hydraulic loading for each of the sounded lakes. The estimates are based on streamflow data in the Park area and are theoretical estimates only. They are, however, of value in that they provide an additional basis of comparing the lakes.

METHODS

The methods of measurements and features used for the description of lake drainage and morphometry are given in the explanation of the key to Table 1 found on page 8.

Table 6 contains morphometric indices which are not defined in Table 1. They are:

Relative basin size ($A':A$): Both A' and A are given in the same units, where the area of the drainage basin, including the lake (A'), is divided by the area of the lake (A). The relative basin size is often expressed as ($A'' : A$), where A'' is the area of the drainage basin excluding lake area (land drainage area, Brunskill and Schindler (1971), Kerekes (1972, 1974)). The numerical value of $A' : A$ can be transformed to $A'' : A$ by deducting 1 from the value of $A' : A$. For example, the $A' : A$ value for Warren Lake is 36.4. The corresponding $A'' : A$ value would be 35.4.

Water retention time (t_w): Where t_w is the inverse of the flushing rate (FR).

Hydraulic loading (q_s): Also called water discharge height, is the product of flushing rate times mean depth.

Shore length to lake surface area ratio ($L:A$) (Rawson, 1960): Where the shore length (L) is given in kilometers and the lake surface area (A) is given in square kilometers.

Mean depth to maximum depth ratio ($\bar{z}:z_m$): Which, multiplied by 3, gives the development of volume (welch, 1948).

Sounding

Sixteen of the lakes were sounded during the summer of 1976 using a Raytheon Explorer II recording fathometer fixed to the side of a 14-foot

aluminum boat. Dundas Lakes #3, 4 and 5 were sounded with a Lowrance "Fish Lo-k-tor". Six of the lakes were previously sounded (Solman, 1951; Kerekes unpubl. data; Park Warden Service, unpubl. data). These soundings were verified during the summer of 1976.

Bathymetric Maps

Lake outlines were enlarged from aerial photographs (Energy, Mines and Resources, June 1973) or 1:15,840 scale maps (Nova Scotia Dept. of Lands and Forests, Crown Land Forestry Series) using a mechanical enlarging device (Teledyne Post 38RA-110 Pantograph). Where aerial photographs were used, map scales were calculated as follows:

$$\text{Scale} = \frac{0.15}{\text{Alt.}} \times E$$

where Alt. = altitude of flight above lake surface (m)

0.15 = focal length of camera (m)

E = enlargement factor

Depth contours were interpolated from the sounding data. Locations of streams and flow directions were based on 1:50,000 NTS maps, aerial photographs and field observations.

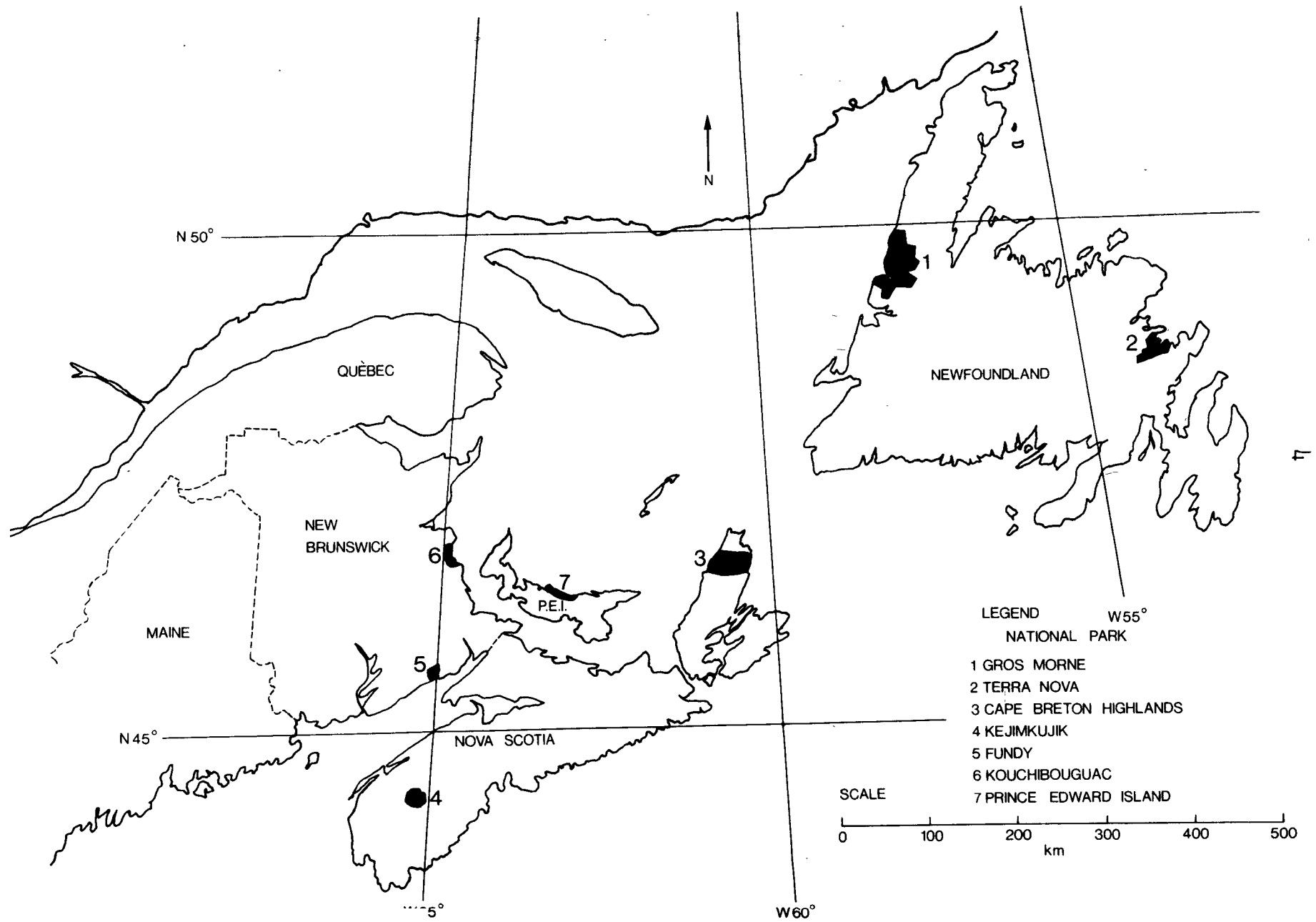


Figure 1. Location of National Parks in the Atlantic Region

PRESENTATION OF DATA

The location of Cape Breton Highlands National Park is shown in Figure 1. Locations of the 62 lakes which were investigated during the 1975-77 field operations are shown in Figure 2 and listed in Table 2 along with names, drainage reference numbers and elevations. Lakes are listed according to drainage reference number (Part I, Aquatic Resources Inventory) throughout the report.

A list of the lakes which have been sounded and the dates of sounding are given in Table 4. In Table 3, all of the lakes investigated are listed according to the surface area size classification proposed by Lacate (1969). Following the Discussion, Tables 5 and 6 list morphometric and hydrologic features and some morphometric indices of the 25 sounded lakes. Table 7 lists morphometric features of the 37 other lakes investigated.

Following Table 7 are morphometry and drainage files for each of the 25 sounded lakes, in order of drainage reference number. For each lake, a drainage and morphometry data sheet which contains information of the location and morphometry of the lake, its drainage area, inlets, outlet, access and developments nearby. Following this a table of surface area, stratum interface areas, stratum volumes, total volume and mean depth is given. Stratum interface areas and volumes are also expressed as percentages of surface area and total volume respectively. The percentage areas and volumes are plotted against depth for each lake. Finally, a bathymetric map of each lake is presented.

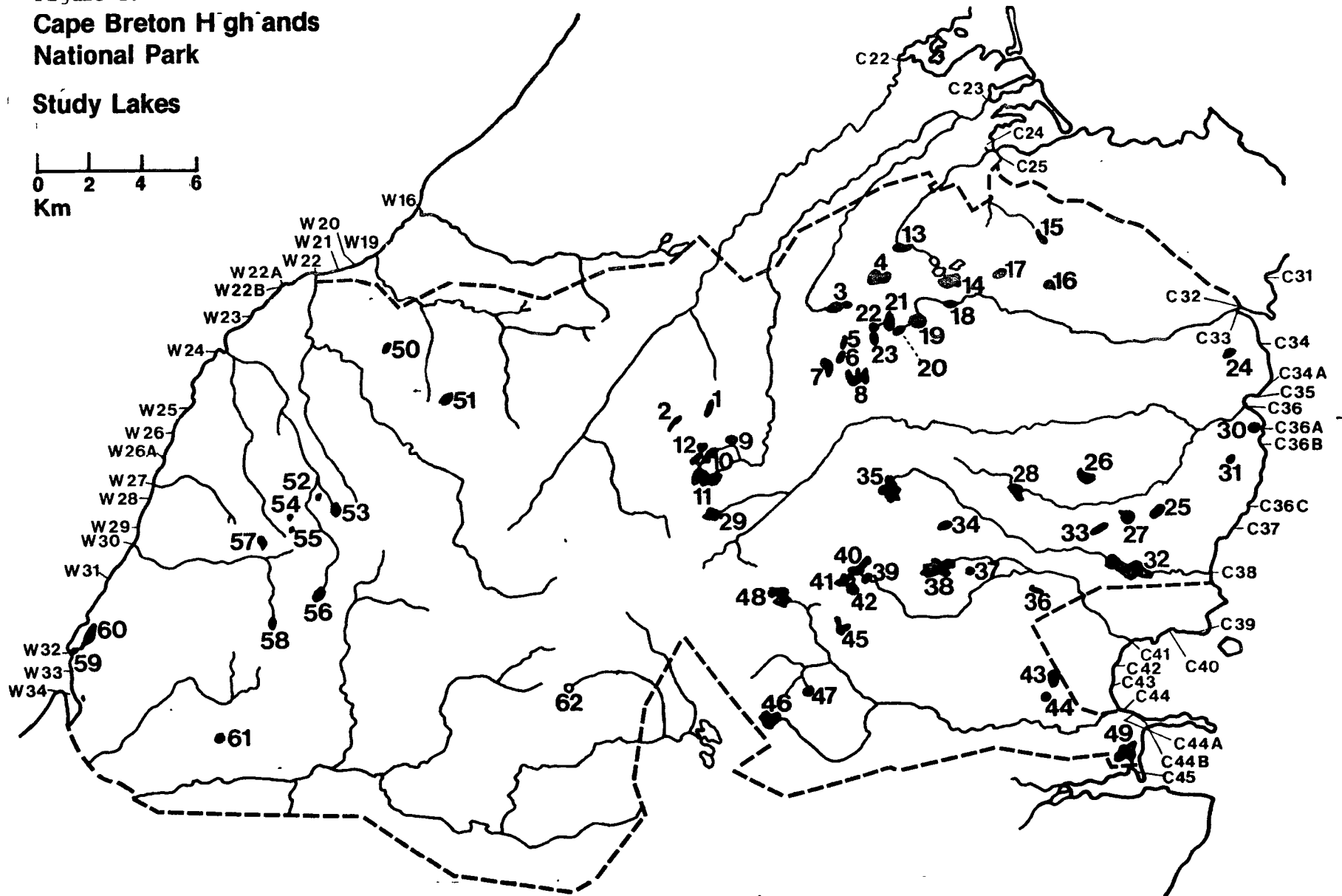
The morphometric data are valid only for the water level on the date of sounding. The bathymetric maps are intended for limnological and fisheries management purposes only. They should not be used as navigation aides because no effort has been made to show hazards which might occur between sounding lines or points.

Figure 2. Location of lakes sampled by Canadian Wildlife Service in Cape Breton Highlands National Park. Sequential numbers 1 to 62 refer to those numbers located in Column 1 of Table 2 on the following page. Drainage basin reference numbers of Cape Breton Island West Drainage (W) and Central Drainage (C) are also shown.

Figure 2.

Cape Breton Highlands National Park

Study Lakes



8

Table 1. Key to Lake Drainage and Morphometric Data Sheets (Tables 8 to 57).
The circled numbers refer to the explanation found on next page.

Lake Drainage and Morphometry

1 Lake 2 Drainage reference #
 Lat. 3 ° 0 ' " Long. 4 ° 0 ' "
 UTM grid: 5
 Elevation: 6 ft 7 m Air distance from sea: 8 km
 Drainage system: 9 Reference # 10
 Drainage system area: 11 km²
 Total lake drainage area: 12 km²
 Lake drainage area outside park: 13 km² = 14 % of total
 Lake area: 15 hectares Island area: 16 hectares
 Water surface area: 17 hectares No. of islands: 18
 Maximum length: 19 km Max. effective length: 20 km
 Maximum width: 21 km Max. effective width: 22 km
 Maximum depth: 23 m Mean depth: 24 m
 Shore length: 25 km Shoreline development: 26
 Lake volume: 27 x 10³ m³ Flushing rate: 28 x/year
 Basin permanence index: 29

30 Inlets:

31 Outlet:

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
-------------	--------------------	-------------------------------------	-------------	--------------------

32 Access: road, trail, water; remote, transitional, ready

33 Developments:

34 Map Code

EXPLANATION OF KEY TO LAKE DRAINAGE AND MORPHOMETRY

1. Lake name. Where National Topographic Series (NTS) 1:50,000 scale maps indicate a limited number of Park lakes, namely: Freshwater L., Warren L., Roper L., Lake of Islands, Sunday L. and the Dundas Lakes, the Park Service has adopted names for most of the remaining lakes (John D. MacDonald, pers. comm., 1976) which are presently under consideration for acceptance by the Canadian Permanent Committee on Names. We have added numbers to names of group lakes for future identification, such as the Dundas Lakes, Roundhill Lakes and Chain Lakes (Part I, Aquatic Resources Inventory). We have also given names to three small bog ponds: Benjie's Bog Pond, Bog Exhibit Pond and Bog South Pond.
2. Lakes are given numbers which signify their positions within the Park. The drainage reference numbers used are defined in Part I of the Aquatic Resources Inventory.
3. The latitude of the sampling station on the lake, estimated to the nearest 5 seconds.
4. The longitude of the sampling station, estimated as in #3.
5. The Universal Transverse Mercator grid reference of the sampling station, estimated to the nearest 100m.
6. The elevation of the lake, in feet above sea level, estimated to the nearest 50 feet.
7. The elevation of the lake, in meters above sea level, converted to the nearest 5 meters, from the elevation in feet.
8. Air distance from the closest sea shore to the lake's approximate center given in kilometers, measured on a 1:50,000 scale map.
9. The name of the stream into which the lake ultimately drains.

10. The number given to the stream as defined in Part I of the Aquatic resources inventory.
11. The total area of the drainage system, obtained by planimetry on a 1:50,000 scale NTS map, given in square kilometers in which the lake is situated.
12. The total area of the lake's catchment basin, including the lake itself and all land apparently sloping toward it, as delimited by heights of land surrounding the lake.
13. That part of the total lake catchment basin which lies outside Park boundaries, obtained as in #12.
14. The percentage of the total lake catchment basin which lies outside Park boundaries. It is an index of the potential for the lake to become contaminated by sources over which the Park administration has no direct control.
15. The surface area of the lake in hectares, including islands. Areas were integrated with a polar compensating planimeter on the bathymetric maps obtained during the summer of 1976.
16. The area in hectares of islands in the lake. This does not include large exposed rocks or shoals which may be submerged for part of the year. Obtained by planimetry as in #15.
17. The actual water surface area of the lake, in hectares, found by subtracting the island area from the total surface area. Water surface areas of the study lakes which were not sounded are taken from Dayborne (1977).
18. The number of islands seen on aerial photographs.
19. The length, in kilometers, of the line connecting the two most remote extremities of the lake. This line is usually straight but can be curved. It crosses no land other than islands (Welch, 1948). Lengths

- were measured with a ruler graduated in mm using the bathymetric maps.
20. The length, in kilometers, of the straight line connecting the most remote extremities of the lake without crossing any land, i.e. the longest stretch of open water (Welch, 1948).
 21. The length, in kilometers, of the straight line connecting the most remote transverse extremities of the lake, approximately at right angles to the maximum length. This also crosses no land other than islands (Welch, 1948).
 22. The length, in kilometers, of the straight line connecting the most remote transverse extremities of the lake without crossing any land (Welch, 1948).
 23. The maximum depth, in meters, found in the lake at the time of sounding.
 24. The mean depth, or average depth, was calculated by dividing lake volume (expressed as cubic meters, m³) by its water surface area (expressed as square meters, m²).
 25. The length of the shoreline, in kilometers, was measured with a roto-meter using the bathymetric maps of the lakes. Shore lengths of the study lakes which were not sounded are taken from Dayborne (1977).
 26. Shoreline development is an index of the degree of irregularity of the shoreline. It increases from a minimum of 1.0, the D_s of a perfectly round lake, as the shape becomes more irregular and/or elongated. Shoreline development was calculated by the formula:

$$D_s = \frac{s}{2\sqrt{a\pi}}$$

where s = shore length (m)

a = surface area (m²)

27. The volume of a lake, in thousands of cubic meters, calculated by the

method given by Welch (1948) using stratum interface areas integrated by planimeter as for the surface area from bathymetric charts. The formula used is:

$$\text{Volume} = \frac{h}{3} (a_1 + a_2 + \sqrt{a_1 a_2})$$

where h = vertical depth of each horizontal stratum (usually 1 meter)

a_1 = area of the upper surface

a_2 = area of the lower surface

The total volume is the sum of the volumes of all the horizontal strata (Welch, 1948).

28. Flow data from two stations on the Cheticamp River and one on Indian Brook (Anon., 1970-1977) were used to calculate the mean annual moisture surplus in the Park area of 1.6m/yr. Flushing rates were then calculated as follows:

$$\text{Flushing rate (yr}^{-1}\text{)} = \frac{1600 \cdot A'}{V}$$

where 1600 = moisture surplus (mm)

A' = drainage area of lake (km^2)

V = lake volume (10^3m^3)

29. The basin permanence index was determined by dividing lake volume (10^6m^3) by shore length (km) as proposed by Kerekes (1977).
30. List of inlets, their reference numbers and drainage areas in square kilometers. Stream names and reference numbers are defined in Part I of the Aquatic Resources Inventory. The drainage areas of the streams are given by Dayborne (1977).
31. The name of stream into which the lake ultimately drains is taken from NTS 1:50,000 scale maps and referenced (Part I, Aquatic Resources Inventory).

32. The primary mode and ease of access to each lake and the type of development near the lakes were determined by observation during the 1975-77 field operations. Where access is classed as ready, a lake is accessible either by road or by a short hike from the nearest road. Transitional access lakes can be reached by a well established trail. Remote lakes are those which are accessible only by a difficult walk, bombardier or float-equipped aircraft.
33. Developments include any past or existing modifications to the immediate environment of the lake, such as old sawmills, roads, campsites, dams, etc.
34. Where applicable, reference to Energy, Mines and Resources aerial photographs (1973) and Department of Lands and Forests, Crown Land Forestry Series, 1:15,840 scale maps (based on aerial photographs taken in 1953), used to determine areas and shorelengths. A.P. denotes aerial photograph, while S.M. denotes scale map.

Table 2. The lakes sampled in Cape Breton Highlands National Park with geographical locations and approximate surface elevations. Lakes are listed in order of drainage basin reference number as defined in Part 1, Aquatic Resources Inventory. Sequential numbers 1 to 62 refer to Fig. 2.

No.	Drainage Reference	Lake	Latitude	Longitude	Elevation	
					ft	m
1	C22.13.4b	Bear #1	46°46'20"	60°36'48"	1500	460
2	C22.13d	Deer	46 45 57	60 37 54	1550	470
3	C23.1.3e	Chain #4	46 48 44	60 32 30	1300	400
4	C23.1d5a	John Dee	46 48 50	60 31 10	1350	410
5	C23.1e	Roundhill #3	46 47 56	60 33 10	1300	400
6	C23.1f	Roundhill #2	46 47 35	60 33 36	1300	400
7	C23.1f8a	Roundhill #1	46 47 30	60 33 45	1300	400
8	C23.1g	Swim	46 47 20	60 32 47	1350	410
9	C23.9a	Unnamed	46 45 50	60 36 31	1550	470
10	C23.9d	Twin #1	46 45 22	60 37 15	1600	490
11	C23c	Baldwin	46 44 50	60 37 10	1600	490
12	C23d	Twin #2	46 45 30	60 37 30	1600	490
13	C24a	Burton	46 49 54	60 31 00	1250	380
14	C24g	Glasgow	46 49 10	60 29 30	1350	410
15	C25.2.1a	Paquette	46 50 00	60 26 00	850	260
16	C33.3b	Mica Hill	46 48 52	60 26 35	1100	335
17	C33.3d	Daisley's	46 49 21	60 28 23	1400	430
18	C33a	Long	46 48 43	60 29 24	1350	410
19	C33b	Round	46 48 22	60 30 30	1400	430
20	C33d	Unnamed	46 48 06	60 31 12	1450	440
21	C33e	Lobster	46 48 06	60 31 23	1450	440
22	C33g	Five Island #2	46 48 18	60 31 47	1450	440
23	C33h	Five Island #1	46 48 06	60 32 08	1450	440
24	C34a	Jigging Cove	46 47 20	60 20 30	150	45
25	C36.1.2a	Broad Cove Mountain	46 44 00	60 23 30	600	185
26	C36.1.3b	Brown's	46 44 53	60 25 35	1000	305
27	C36.1.5a	Rudderham	46 44 00	60 24 26	650	200
28	C36.1b	Branch Pond	46 44 30	60 27 20	1000	305
29	C36.13a	Sunday	46 44 08	60 37 00	1600	490
30	C36Aa	Wreck Beach Pond	46 45 55	60 19 35	50	15
31	C36B.a	Unnamed	46 45 00	60 21 00	350	105
32	C38a	Warren	46 42 50	60 23 40	50	15
33	C38a3a	Cradle	46 43 50	60 26 00	850	260
34	C38.4a	Spud	46 43 50	60 29 50	1250	380
35	C38b	Lake of Islands	46 44 30	60 30 20	1400	430

continued....

Table 2 continued

No.	Drainage Reference	Lake	Latitude	Longitude	Elevation	
					ft	m
36	Ch1.4a	Long Pond	46°41'25"	60°26'30"	400	120
37	Ch1.5.2a	Unnamed	46 43 00	60 29 02	1350	410
38	Ch1.5c	Roper	46 42 50	60 29 52	1350	410
39	Ch1b	Dundas #2	46 42 43	60 31 55	1450	440
40	Ch1c	Dundas #3	46 42 50	60 32 20	1450	440
41	Ch1d	Dundas #4	46 42 37	60 32 50	1450	440
42	Ch1d10a	Dundas #5	46 42 25	60 32 32	1450	440
43	Ch2b	Cann's	46 40 20	60 26 00	700	215
44	Ch3a	MacDougall's	46 40 20	60 26 24	800	245
45	Ch4.6.1d	Gull	46 41 25	60 32 30	1450	440
46	Ch4.8a	Two Island	46 39 35	60 35 10	1550	470
47	Ch4.9.1.2a	Indian	46 40 14	60 33 50	1500	460
48	Ch4a	White Hill	46 42 15	60 35 00	1600	490
49	Ch5a	Freshwater	46 38 40	60 23 47	10	3
50	W19.3a	Sugar Brook #2	46 47 55	60 47 00	1300	400
51	W19.4(9)a	MacIntosh	46 46 45	60 45 50	1300	400
52	(W22.2)	Benjie's Bog Pond	46 49 50	60 49 16	1350	410
53	W22.2a	Benjie's	46 44 25	60 48 32	1350	410
54	W24.8.1a	Bog Exhibit Pond	46 44 22	60 49 48	1350	410
55	W24.8.1c	Bog South Pond	46 44 26	60 49 48	1350	410
56	W24a	Fishing Cove	46 42 33	60 49 40	1450	440
57	W30.6a	French	46 43 41	60 51 56	1400	430
58	W30b	Corney	46 41 31	60 50 35	1500	460
59	W32a	Little Presqu'ile	46 41 10	60 57 35	5	2
60	W32b	Presqu'ile	46 41 25	60 57 25	5	2
61	W34.3.3c	Lac des Plees Ferrees #3	46 39 05	60 53 03	1450	440
62	W34.32.1a	Cranberry	46 40 15	60 41 33	1650	505

Table 3. Lakes sampled in Cape Breton Highlands National Park listed according to surface area class as proposed by Lacate (1969).

Size classes:	#1	0-5 hectares
	#2	6-20 "
	#3	21-250 "
	#4	251-2000 "

<u>Class #1</u>	<u>Drainage Reference</u>	<u>Lake Name</u>
28 lakes	C22.13.4b	Bear #1
	C23.1f	Roundhill #2
	C23.9a	
	C23.9d	Twin #1
	C25.2.1a	Paquette
	C33.3b	Mica Hill
	C33.3d	Daisley's
	C33d	
	C33h	Five Island #1
	C36.1.3b	Brown's
	C36Aa	Wreck Beach Pond
	C36Bb	
	C41.5.2a	
	C41b	Dundas #2
	C41d10a	Dundas #5
	C43a	MacDougall's
	C44.9.1.2a	Indian
	W19.3a	Sugar Brook #2
	W19.4.9a	MacIntosh
	(W22.2)	Benjie's Bog Pond
	W22.2a	Benjie's
	W24.8.1a	Bog Exhibit Pond
	W24.8.1c	Bog South Pond
	W24a	Fishing Cove
	W30b	Corney
	W32a	Little Presqu'ile
	W32b	Presqu'ile
	W23.3.3c	Lac des Plees Ferrees #3

Table 3 continued

<u>Class #2</u>	<u>Drainage Reference</u>	<u>Lake Name</u>
24 lakes	C22.13d	Deer
	C23.1.3d	Chain #4
	C23.1e	Roundhill #3
	C23.1f8a	Roundhill #1
	C23d	Twin #2
	C24a	Burton
	C33a	Long
	C33b	Round
	C33e	Lobster
	C33g	Five Island #2
	C34a	Jigging Cove
	C36.1.2a	Broad Cove Mountain
	C30.1.5a	Rudderham
	C36.1b	Branch Pond
	C36.13a	Sunday
	C38a3a	Cradle
	C38.4a	Spud
	C41.4a	Long Pond
	C41c	Dundas #3
	C41d	Dundas #4
	C42b	Cann's
	C44.6.1d	Gull
	C30.6a	French
	W34.32.1a	Cranberry
<u>Class #3</u>		
10 lakes	C23.1d5a	John Dee
	C23.1g	Gwinn
	C23c	Baldwin
	C24g	Glasgow
	C38a	Warren
	C38b	Lake of Islands
	C41.5c	Koper
	C44.8a	Two Island
	C44a	White Hill
	C45a	Freshwater

Table 4 . Lakes sounded in Cape Breton Highlands National Park, with dates of sounding.

Lake	Reference No.	Date of Sounding
John Dee	C23.1d5a	Oct. 6/76
Roundhill #2	C23.1f	Aug. 4/76
Roundhill #1	C23.1f8a	Aug. 4/76
Gwinn	C23.1g	Aug. 3/76
Baldwin	C23c	July 29/76
Glasgow	C24g	Oct. 8/76
Paquette	C25.2.1a	April 14/73
Long	C33a	Oct. 6/76
Round	C33b	Oct. 4/76
Lobster	C33e	Oct. 5/76
Jigging Cove	C34a	April 10/73
Branch Pond	C36.1b	July 1/76
Warren	C38a	June 29/76
Dundas #3	C41c	July 29/76
Dundas #4	C41d	July 29/76
Dundas #5	C41d10a	July 29/76
Cann's	C42b	July 13/76
MacDougall's	C43a	July 13/76
Two Island	C44.8a	Aug. 12/76
Freshwater	C45a	1966
Benjie's	W22.2a	March 3/76
Fishing Cove	W24a	March 4/76
French	W30.6a	April 9/73
Little Presqu'ile	W32a	June 23/47*
Presqu'ile	W32b	June 23/47*

*Modified from Solman (1951), verified July 9, 1976.

Table 5. Morphometric features of lakes in Cape Breton Highlands National Park. Abbreviations and units are given at the end of the table.

Drainage reference	Lake name	A	IA	A'	V	\bar{z}	z_m	L	ML	MW
C23.1d5a	John Dee	23.5	0.9	1.4	482.0	2.05	9.4	2.90	0.88	0.49
C23.1f	Roundhill #2	5.1	0.0	3.8	47.0	0.93	2.0	1.17	0.55	0.16
C23.1f0a	Roundhill #1	17.1	0.0	1.0	233.0	1.36	4.4	2.07	0.76	0.31
C23.1g	Gwinn	23.0	0.7	1.8	259.0	1.13	3.0	3.66	0.78	0.63
C23c	Baldwin	45.8	1.3	3.8	552.0	1.24	3.0	4.82	1.17	0.52
C24a	Glasgow	23.9	0.4	1.4	1,057.0	4.45	14.6	2.48	0.32	0.42
C25.2.1a	Paquette	5.0	0.0	0.6	46.0	0.91	1.8	1.21	0.45	0.19
C33a	Long	6.6	0.0	5.0	41.0	0.62	1.5	1.62	0.64	0.18
C33b	Round	14.4	0.1	3.7	140.0	0.97	2.0	1.60	0.55	0.35
C33e	Lobster	9.5	0.1	1.6	96.0	1.01	1.9	1.97	0.80	0.24
C34a	Jigging Cove	6.2	0.0	1.2	55.0	0.89	2.0	1.49	0.74	0.18
C35.1b	Branch Pond	14.9	0.0	5.4	363.0	2.43	6.5	1.81	0.69	0.32
C30a	Warren	89.8	0.0	32.0	14,298.0	15.90	31.0	4.96	1.95	0.59
C41c	Dundas #3	13.0	0.0	6.0	113.0	0.87	2.1	3.48	0.88	0.26
C41d	Dundas #4	16.3	0.1	4.7	247.0	1.52	2.5	2.26	0.59	0.32
C41d10a	Dundas #5	4.8	0.1	0.8	14.0	0.30	0.9	0.91	0.29	0.25
C42b	Cann's	10.4	0.1	0.8	210.0	2.00	9.2	1.93	0.59	0.30
C43a	MacDougall's	5.0	0.0	1.0	170.0	3.40	11.5	1.02	0.28	0.24
C44.0a	Two Island	25.6	1.4	1.8	362.0	1.42	5.5	3.18	0.70	0.66
C45a	Freshwater	42.2	0.6	3.4	2,737.0	6.50	16.0	4.10	1.15	0.74
W22.2a	Benjie's	3.3	0.0	0.6	16.0	0.49	0.7	0.76	0.28	0.15
W24a	Fishing Cove	2.4	0.0	1.2	14.0	0.56	0.8	0.80	0.31	0.14
W30.6a	French	7.0	0.0	0.6	73.0	1.04	2.0	1.44	0.58	0.21
W32a	Little Presqu'ile	0.5	0.0	1.2	7.3	1.49	3.0	0.29	0.11	0.06
W32b	Presqu'ile	4.4	0.0	0.8	93.0	2.10	3.0	1.52	0.67	0.10

A Surface area of lake excluding islands, hectares
 IA Island area, hectares
 A' Drainage basin area including lake, km²

V Lake volume, m³ x 10³
 \bar{z} Mean depth, m
 z_m Maximum depth, m

L Shore length, km
 ML Maximum length, km
 MW Maximum width, km

Table 6. Morphometric indices, hydrologic features and distance from the center of the lake to the closest coastal point of lakes in Cape Breton Highlands National Park. Abbreviations and units are given at the end of the table.

Drainage reference	Lake name	A':A	FR	t _w	q _s	L:A	$\bar{z}:z_m$	D _L	BPI	Distance From sea (km)
C23.ld5a	John Dee	5.9	4.6	0.217	9.4	11.9	0.22	1.69	0.17	7.2
C23.lf	Roundhill #2	74.1	128.0	0.008	119.0	22.9	0.45	1.46	0.04	10.8
C23.lf8a	Roundhill #1	5.8	6.9	0.146	9.3	12.1	0.31	1.41	0.11	11.0
C23.lg	Gwinn	7.8	11.1	0.090	12.5	15.4	0.38	2.12	0.07	10.6
C23c	Baldwin	8.7	11.1	0.090	13.8	10.5	0.41	2.04	0.11	16.3
C24g	Glasgow	6.0	2.2	0.463	9.6	10.2	0.30	1.43	0.43	5.6
C25.2.1a	Paquette	11.6	20.2	0.050	18.4	25.1	0.51	1.52	0.04	4.0
C33a	Long	76.5	198.0	0.005	123.0	24.6	0.41	1.78	0.03	6.5
C33b	Round	25.7	42.3	0.024	41.0	11.0	0.49	1.19	0.09	7.5
C33e	Lobster	17.4	27.5	0.036	27.8	20.7	0.53	1.80	0.05	8.5
C34a	Jigging Cove	19.0	34.1	0.029	30.3	24.0	0.45	1.69	0.04	1.5
C36.1b	Branch Pond	36.4	24.0	0.042	58.3	10.8	0.37	1.18	0.23	7.7
C38a	Warren	36.1	3.6	0.275	57.7	5.5	0.51	1.48	2.88	2.8
C41c	Dundas #3	46.0	84.7	0.012	73.7	26.8	0.41	2.72	0.03	10.9
C41d	Dundas #4	29.0	30.6	0.033	46.5	13.9	0.61	1.58	0.11	11.2
C41d10a	Dundas #5	15.3	82.8	0.012	24.8	18.6	0.33	1.16	0.02	10.8
C42b	Cann's	7.9	6.3	0.159	12.6	18.6	0.22	1.68	0.11	2.0
C43a	MacDougall's	20.6	9.7	0.103	33.0	20.4	0.30	1.29	0.17	2.5
C44.8a	Two Island	7.1	8.1	0.124	11.5	12.4	0.26	1.77	0.11	12.0
C45a	Freshwater	8.1	2.0	0.503	12.9	9.7	0.41	1.79	0.67	0.1
W22.2a	Benjie's	19.7	63.7	0.016	31.2	23.0	0.69	1.18	0.02	8.0
W24a	Fishing Cove	51.4	146.0	0.007	81.8	32.9	0.62	1.45	0.02	7.8
W30.6a	French	7.8	12.0	0.082	12.5	20.4	0.52	1.53	0.05	4.2
W32a	Little Presqu'ile	240.0	263.0	0.004	392.0	58.0	0.50	1.16	0.03	0.1
W32b	Presqu'ile	19.5	14.7	0.068	30.9	34.6	0.70	2.04	0.06	0.2

A':A Drainage area (km²): Lake surface area (km²)

FR Flushing rate (times per year)

t_w water retention time (yr) = 1/FR

q_s Hydraulic loading (m/yr) = FR x \bar{z}

L:A Shorelength (km): Lake surface area (km²)

$\bar{z}:z_m$ Mean depth (m): Maximum depth (m)

D_L Shoreline development = $\frac{L(\text{km})}{2\sqrt{A(\text{km}^2)}\pi}$

BPI Basin permanence index = $V(10^6\text{m}^3):L(\text{km})$

Table 7. Surface areas, shorelengths and air distances from the sea of 37 lakes in Cape Breton Highlands National Park which were sampled but not sounded. Areas and shorelengths are taken from Dayborn (1977).

Drainage reference	Lake name	Surface area (ha)	Shorelength (km)	Air Distance from sea(km)
C22.13.4b	Bear #1	3.4	1.1	15.0
C22.13d	Deer	6.0	2.1	11.2
C23.1.3e	Chain #4	5.5	1.1	8.6
C23.1e	Roundhill #3	7.3	1.9	10.2
C23.9a	Unnamed	0.6	0.3	15.3
C23.9d	Twin #1	4.3	2.0	15.6
C23d	Twin #2	12.8	2.5	15.2
C24a	Burton	9.0	2.0	5.5
C33.3b	Mica Hill	4.3	1.4	5.0
C33.3d	Daisley's	2.9	0.8	5.2
C33d	Unnamed	1.1	0.6	3.4
C33g	Five Island #2	9.8	2.7	8.4
C33h	Five Island #1	2.6	1.2	9.0
C36.1.2a	Broad Cove Mountain	14.9	2.2	3.4
C36.1.3b	Brown's	4.7	1.1	6.4
C36.1.5a	Rudderham	6.4	1.2	4.5
C36.13a	Sunday	14.9	2.0	17.2
C36Aa	Wreck Beach Pond	2.3	0.6	0.05
C36B(a)	Unnamed			1.5
C38a3a	Cradle	9.8	1.8	5.6
C38.4a	Spud	5.6	1.5	9.0
C38b	Lake of Islands	32.9	3.6	11.2
C41.4a	Long Pond	9.4	1.8	4.0
C41.5.2a	Unnamed	0.4	0.4	7.6
C41.5c	Roper	30.3	2.4	6.1

continued....

Table 7 continued

Drainage reference	Lake name	Surface area (ha)	Shorelength (km)	Air distance from sea (km)
041b	Dundas #2	3.6	1.0	10.3
044.6.1d	Gull	15.4	2.5	10.4
044.9.1.2a	Indian	4.9	1.2	10.3
044a	White Hill	27.0	2.6	13.7
#19.3a	Sugar brook #2	4.6	1.2	3.8
#19.4(9)a	MacIntosh	4.7	1.0	6.3
(#22.2)	Benjie's Bog Pond	<0.1		6.4
#24.8.1a	Bog Exhibit Pond	<0.1		6.3
#24.8.1c	Bog South Pond	<0.1		6.4
#30b	Jorney	4.8	1.0	7.2
#34.3.3c	Lac des Plees Ferrees #3	1.6	0.7	6.2
#34.32.1a	Cranberry	9.3	1.3	18.8

Table 8: John Dee Lake, C23.1d5a. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

John Dee Lake Drainage reference # C23.1d5a
 Lat. 46° 0' 48" 50" Long. 60° 0' 31" 10"
 UTM grid: _____
 Elevation: 1350 ft 410 m Air distance from sea: 7.2 km
 Drainage system: Middle Aspy River Reference # C23
 Drainage system area: 43.1 km²
 Total lake drainage area: 1.38 km²
 Lake drainage area outside park: 0 km² = 0 % of total
 Lake area: 24.4 hectares Island area: 0.9 hectares
 Water surface area: 23.5 hectares No. of islands: 1
 Maximum length: 0.88 km Max. effective length: 0.85 km
 Maximum width: 0.49 km Max. effective width: 0.49 km
 Maximum depth: 9.4 m Mean depth: 2.05 m
 Shore length: 2.9 km Shoreline development: 1.69
 Lake volume: 482. x 10³ m³ Flushing rate: 4.6 x/year
 Basin permanence index: 0.17
 Inlets: _____ Outlet: _____

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
				<u>C23.1d5</u>

Access: road, trail, water; remote, transitional, ready

Developments:

Map Code: S:M CB115(d)

Table 9. Surface area, stratum interface areas, stratum volumes and total volume of John Dee Lake (323.1d5a), Cape Breton Highlands National Park, Nova Scotia.

Depth meters	Area		Stratum meters	Volume	
	hectares	% of total		m ³ x 10 ³	% of total
0	23.5	100.	0-1	212.1	44.0
1	19.0	81.0	1-2	144.1	29.9
2	10.2	43.5	2-3	51.1	10.6
3	3.0	12.6	3-4	24.1	5.0
4	1.9	8.2	4-5	16.9	3.5
5	1.5	6.3	5-6	13.5	2.8
6	1.2	5.2	6-7	10.1	2.1
7	0.8	3.3	7-8	6.7	1.4
8	0.6	2.6	8-9	2.9	0.6
9	0.1	0.4	9-9.4	0.1	0.02
Mean depth = 2.05m			Total	482.0	

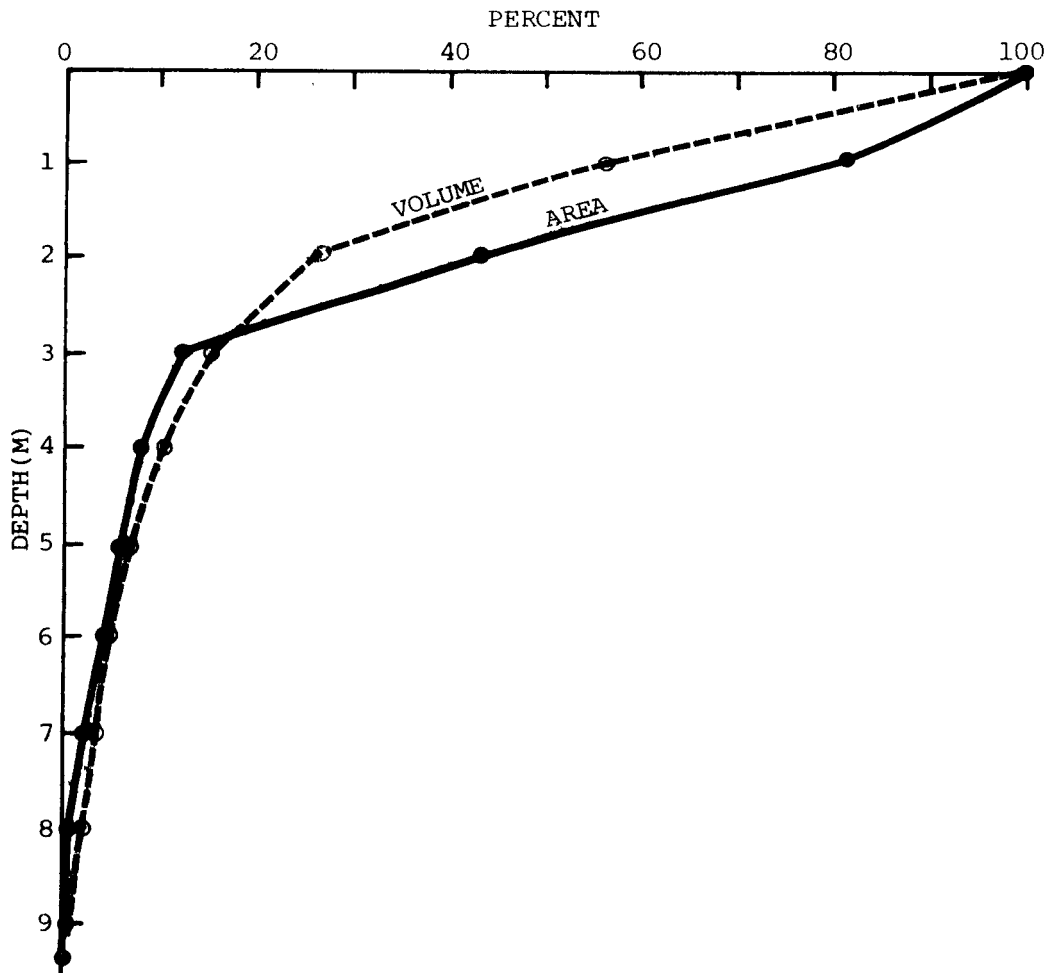


Figure 3 . Area and volume depth curves,
John Dee Lake (C23.1d5a), Cape Breton
Highlands National Park, Nova Scotia.

Figure 4 . Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of John Dee Lake, C23.1d5a, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: Oct. 6, 1976

Elevation: 410 m

Surface area: 23.5 ha

Mean depth: 2.1 m

Flushing rate: 4.6/yr

Water retention: 0.22 yr.

Index of basin permanence: 0.17



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John Dee Lake
C 23.1d5a

Contours in meters
 † Direction of Flow
 + Deep Station



Meters



Table 10. Roundhill #2 Lake, C23.1f. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Roundhill #2 Lake Drainage reference # C23.1f
 Lat. 46° 47' 35" Long. 60° 33' 36"
 UTM grid: _____
 Elevation: 1300 ft 400 m Air distance from sea: 10.8 km
 Drainage system: Middle Aspy River Reference # C23
 Drainage system area: 43.1 km²
 Total lake drainage area: 3.78 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 5.1 hectares Island area: _____ hectares
 Water surface area: 5.1 hectares No. of islands: 0
 Maximum length: 0.55 km Max. effective length: 0.55 km
 Maximum width: 0.16 km Max. effective width: 0.16 km
 Maximum depth: 2.0 m Mean depth: 0.93 m
 Shore length: 1.17 km Shoreline development: 1.46
 Lake volume: 47.3 x 10³ m³ Flushing rate: 128 x/year
 Basin permanence index: 0.04

Inlets:

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>
South Aspy R.	C23.1 C23.1f8	

Outlet:

<u>Name</u>	<u>Reference #</u>
South Aspy R.	C23.1

Access: road, trail, water; remote, transitional, ready

Developments:

Map Code: A.P. A23305-12

Table 11. Surface area, stratum interface areas, stratum volumes and total volume of Roundhill #2 Lake (C23.1f), Cape Breton Highlands National Park, Nova Scotia.

Roundhill #2 Lake C23.1f

Depth meters	Area		Stratum meters	Volume	
	hectares	% of total		$m^3 \times 10^3$	% of total
0	5.1	100.	0-1	37.2	78.6
1	2.5	49.0	1-1.5	8.3	17.5
1.5	0.9	18.3	1.5-2.0	1.8	3.8
2.0	0.02	0.5			
Mean depth = 0.93m			Total	47.3	

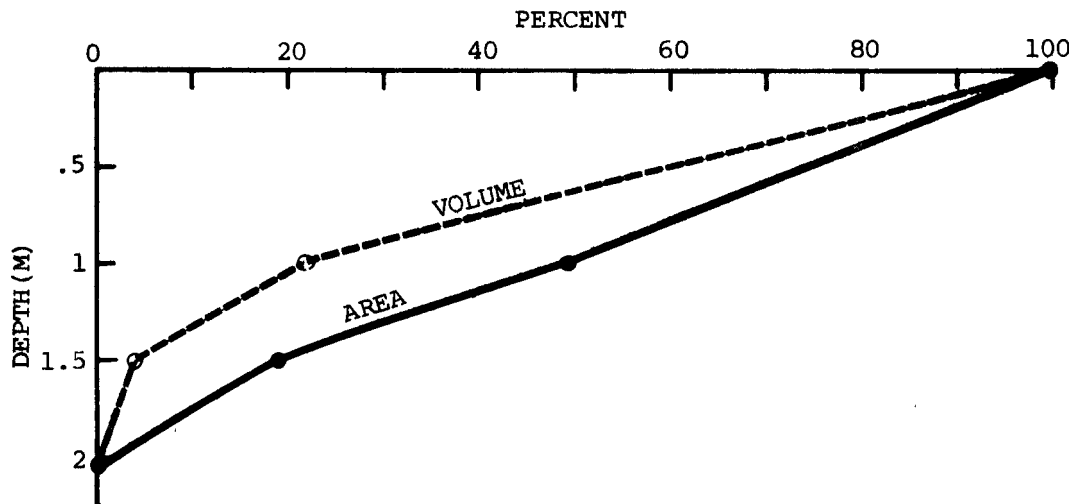


Figure 5. Area and volume depth curves, Roundhill #2 Lake (C23.1f), Cape Breton Highlands National Park, Nova Scotia.

Table 12. Roundhill #1 Lake, C23.1f8a. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Roundhill #1 Lake Drainage reference # C23.1f8a
 Lat. 46° 47' 30" Long. 60° 33' 45"
 UTM grid: _____
 Elevation: 1300ft 400 m Air distance from sea: 11.0 km
 Drainage system: Middle Aspy River Reference # C23
 Drainage system area: 43.1 km²
 Total lake drainage area: 1.00 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 17.1 hectares Island area: _____ hectares
 Water surface area: 17.1 hectares No. of islands: 0
 Maximum length: 0.76 km Max. effective length: 0.76 km
 Maximum width: 0.31 km Max. effective width: 0.31 km
 Maximum depth: 4.4 m Mean depth: 1.36 m
 Shore length: 2.07 km Shoreline development: 1.41
 Lake volume: 233. x 10³ m³ Flushing rate: 6.87 x/year
 Basin permanence index: 0.11
 Inlets: Outlet:

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
				<u>C23.1f8</u>

Access: road, trail, water; remote, transitional, ready

Developments:

Map Code: A.P. A23305-12

Table 13. Surface area, stratum interface areas, stratum volumes and total volume of Roundhill #1 Lake (C23.lf8a), Cape Breton Highlands National Park, Nova Scotia.

Roundhill #1 Lake C23.lf8a

Depth meters	Area		Stratum meters	Volume	
	Hectares	% of total		m ³ x 10 ³	% of total
0	17.1	100.	0-1	144.2	61.9
1	11.9	69.6	1-2	72.8	31.2
2	3.5	20.5	2-3	15.1	6.5
3	0.2	1.2	3-4	0.9	0.4
4	0.02	0.1	4-4.4	0.03	0.01
Mean depth = 1.36m			Total	233.0	

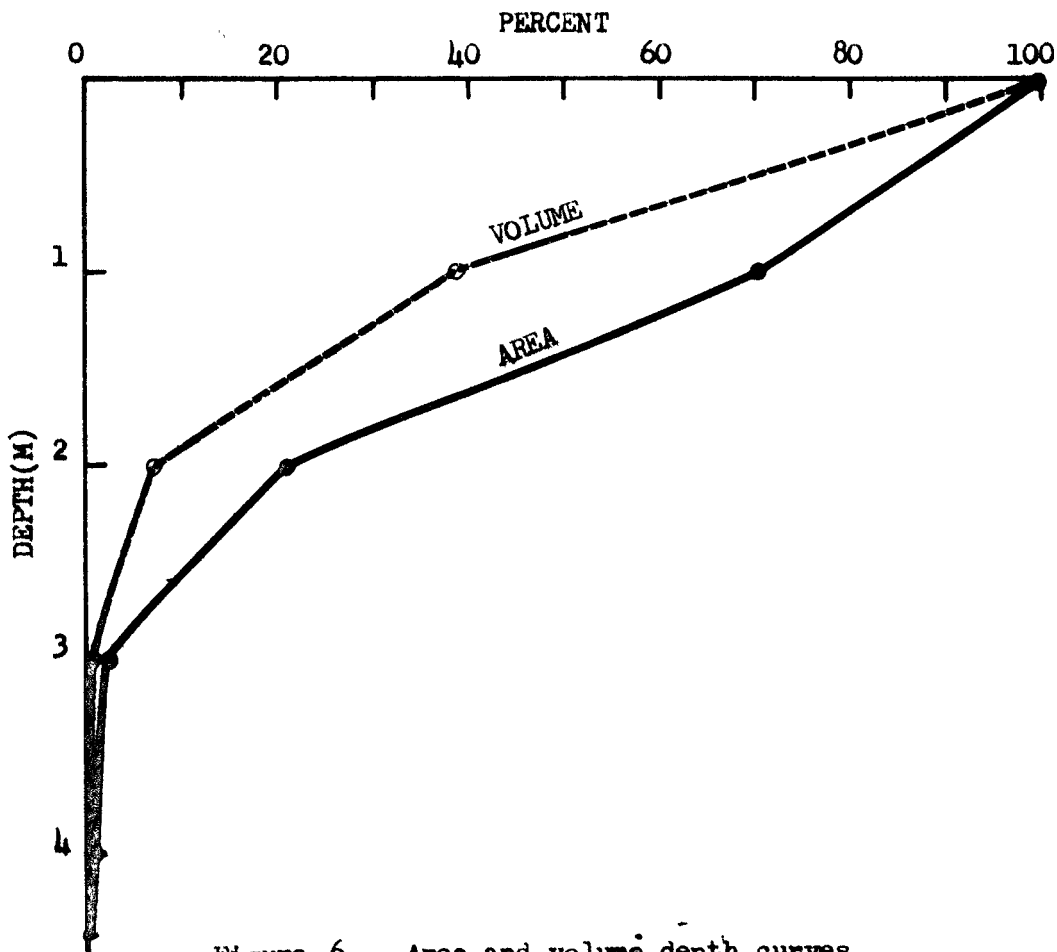


Figure 6. Area and volume depth curves, Roundhill #1 Lake (C23.lf8a), Cape Breton Highlands National Park, Nova Scotia.

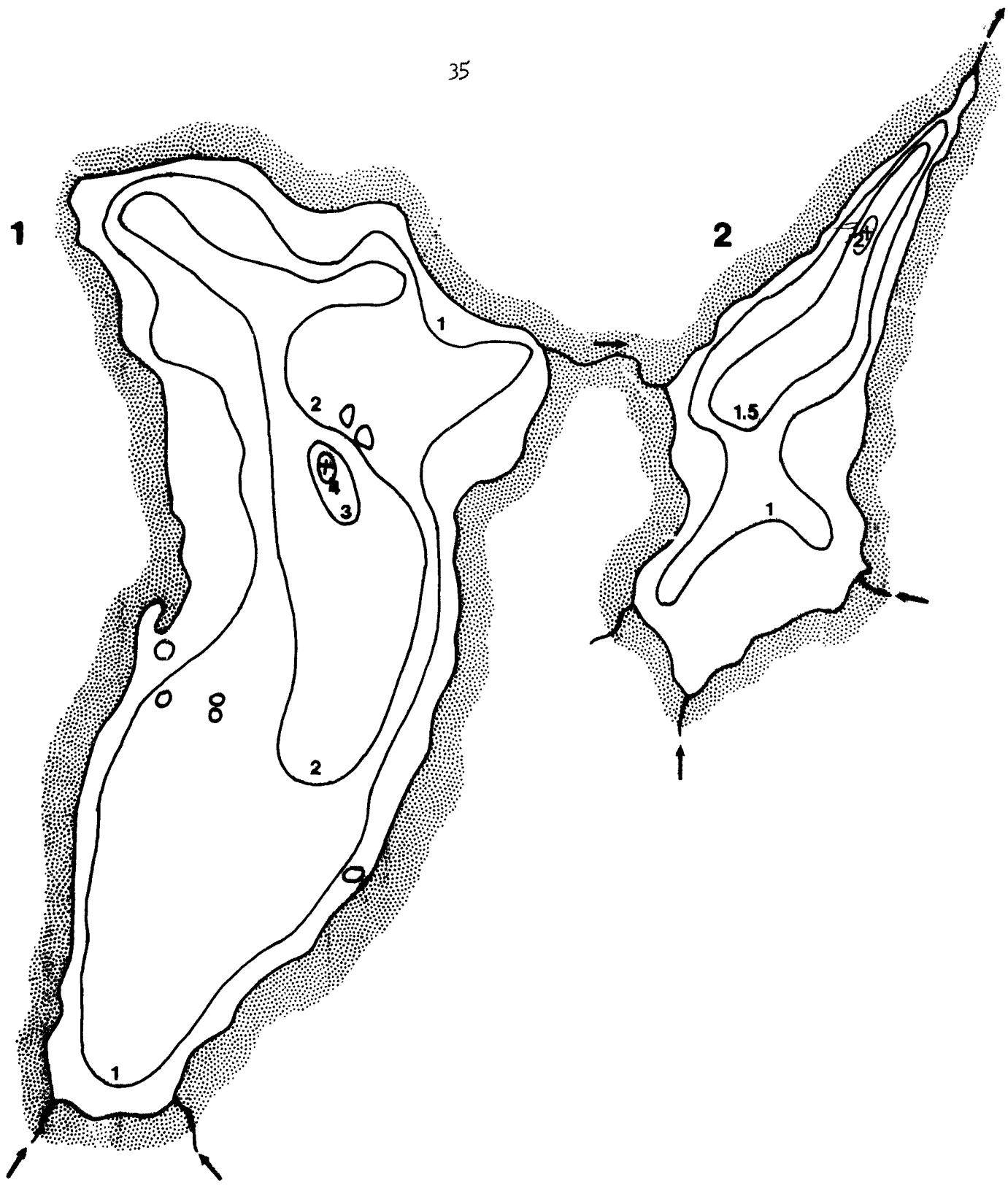
Figure 7 . Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Roundhill #2 and #1 Lakes, C23.1f and C23.1f8a, Cape Breton Highlands National Park, Nova Scotia.

Roundhill #2 Lake, C23.1f:

Date of sounding: Aug. 4, 1976
Elevation: 400 m
Surface area: 5.1 ha
Mean depth: 0.93 m
Flushing rate: 128/yr
Water retention: 0.008 yr.
Index of basin permanence: 0.04

Roundhill #1 Lake, C23.1f8a:

Date of sounding: Aug. 4, 1976
Elevation: 400 m
Surface area: 17.1 ha
Mean depth: 1.4 m
Flushing rate: 6.9/yr
Water retention: 0.15 yr.
Index of basin permanence: 0.11



Roundhill Lakes 1, 2
C 23.1F8a
C 23.1F

Contours in meters
↑ Direction of Flow
+ Deep Station



Meters

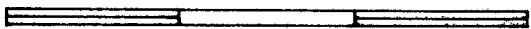


Table 14. Gwinn Lake, C23.lg. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Gwinn Lake Drainage reference # C23.lg
 Lat. 46 ° 47 ' 20 " Long. 60 ° 32 ' 47 "
 UTM grid: _____
 Elevation: 1350 ft 410 m Air distance from sea: 10.6 km
 Drainage system: Middle Aspy River Reference # C23
 Drainage system area: 43.1 km²
 Total lake drainage area: 1.80 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 23.7 hectares Island area: 0.7 hectares
 Water surface area: 23.0 hectares No. of islands: 6
 Maximum length: 0.78 km Max. effective length: 0.78 km
 Maximum width: 0.63 km Max. effective width: 0.50 km
 Maximum depth: 3.3 m Mean depth: 1.13 m
 Shore length: 3.66 km Shoreline development: 2.12
 Lake volume: 259. x 10³ m³ Flushing rate: 11.1 x/year
 Basin permanence index: 0.07
 Inlets: _____ Outlet: _____

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
			South Aspy R.	C23.1

Access: road, trail, water; remote, transitional, ready

Developments:

Map Code: A.P. A23305-12

Table 15. Surface area, stratum interface areas, stratum volumes and total volume of Gwinn Lake (C23.lg), Cape Breton Highlands National Park, Nova Scotia.

Gwinn Lake C23.lg

Depth meters	Area		Stratum meters	Volume	
	hectares	% of total		m ³ x 10 ³	% of total
0	23.0	100.	0-1	177.0	68.3
1	12.9	56.1	1-2	71.7	27.7
2	2.7	11.7	2-3	10.5	4.0
3	0.06	0.3			
Mean depth = 1.13m			Total	259.3	

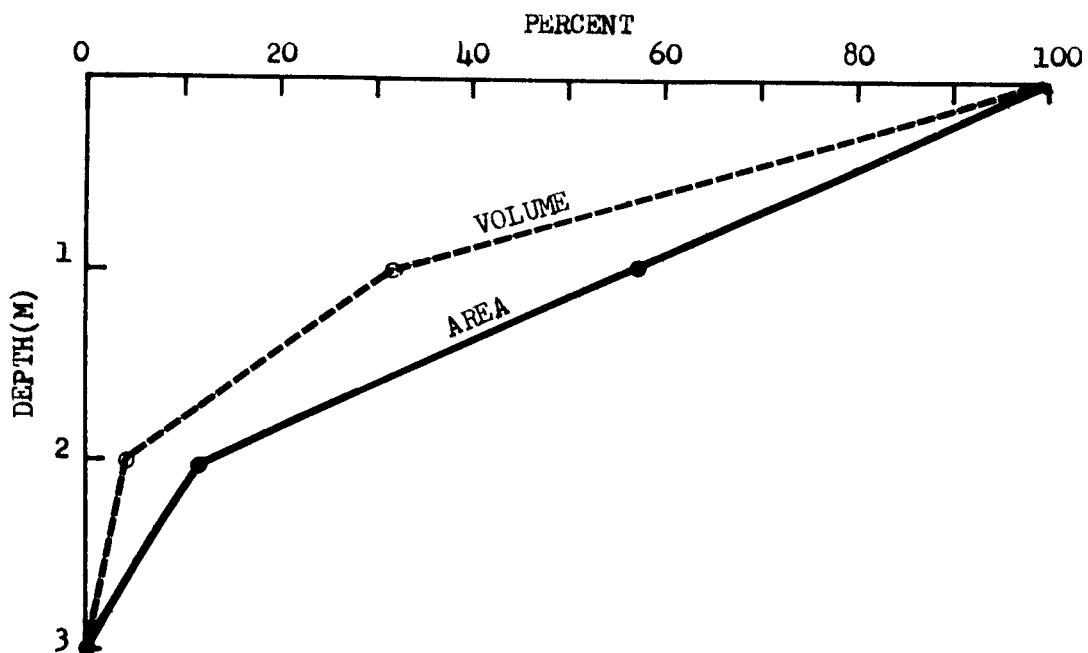
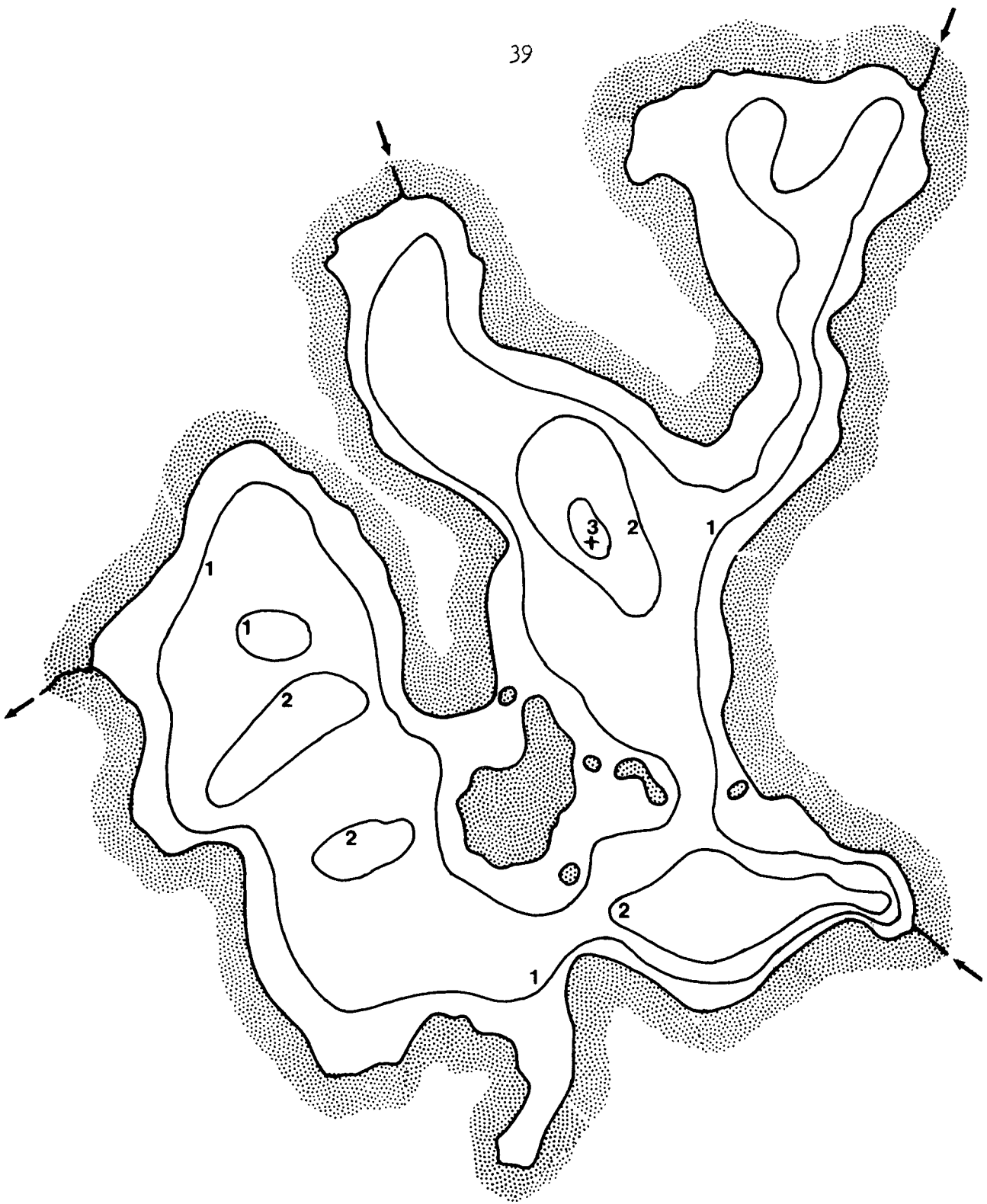


Figure 8. Area and volume depth curves, Gwinn Lake (C23.lg), Cape Breton Highlands National Park, Nova Scotia.

Figure 9 . Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Gwinn Lake, C23.lg, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: Aug. 3, 1976
Elevation: 410 m
Surface area: 23.0 ha
Mean depth: 1.1 m
Flushing rate: 11/yr
Water retention: 0.09 yr.
Index of basin permanence: 0.07



**Gwinn Lake
C 23.1g**

Contours in meters
↑ Direction of Flow
+ Deep Station

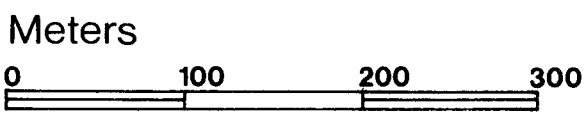


Table 16. Baldwin Lake, C23c. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Baldwin Lake Drainage reference # C23c
 Lat. 46° 44' 50" Long. 60° 37' 10"
 UTM grid: _____
 Elevation: 1600 ft 490 m Air distance from sea: 16.3 km
 Drainage system: Middle Aspy River Reference # C23
 Drainage system area: 43.1 km²
 Total lake drainage area: 3.85 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 45.8 hectares Island area: 1.3 hectares
 Water surface area: 44.4 hectares No. of islands: 20+
 Maximum length: 1.17 km Max. effective length: 1.16 km
 Maximum width: 0.52 km Max. effective width: 0.52 km
 Maximum depth: 3.0 m Mean depth: 1.24 m
 Shore length: 4.82 km Shoreline development: 2.04
 Lake volume: 552 x 10³ m³ Flushing rate: 11.1 x/year
 Basin permanence index: 0.11

Inlets:		Outlet:	
<u>Name</u>	<u>Reference #</u>	<u>Name</u>	<u>Reference #</u>
Middle Aspy R.	C23	Middle Aspy R.	C23

Access: road, trail, water; remote, transitional, ready

Developments:

Map Code: A.P. A23305-27

Table 17. Surface area, stratum interface areas, stratum volumes and total volume of Baldwin Lake (C23c), Cape Breton Highlands National Park, Nova Scotia.

Baldwin Lake C23c

Depth meters	Area		Stratum meters	Volume	
	hectares	% of total		m ³ x 10 ³	% of total
0	44.4	100.	0-1	353.4	64.0
1	27.0	60.7	1-2	165.7	30.0
2	8.3	18.7	2-3	33.1	6.0
3	0.1	0.3			
Mean depth = 1.24m			Total	552.2	

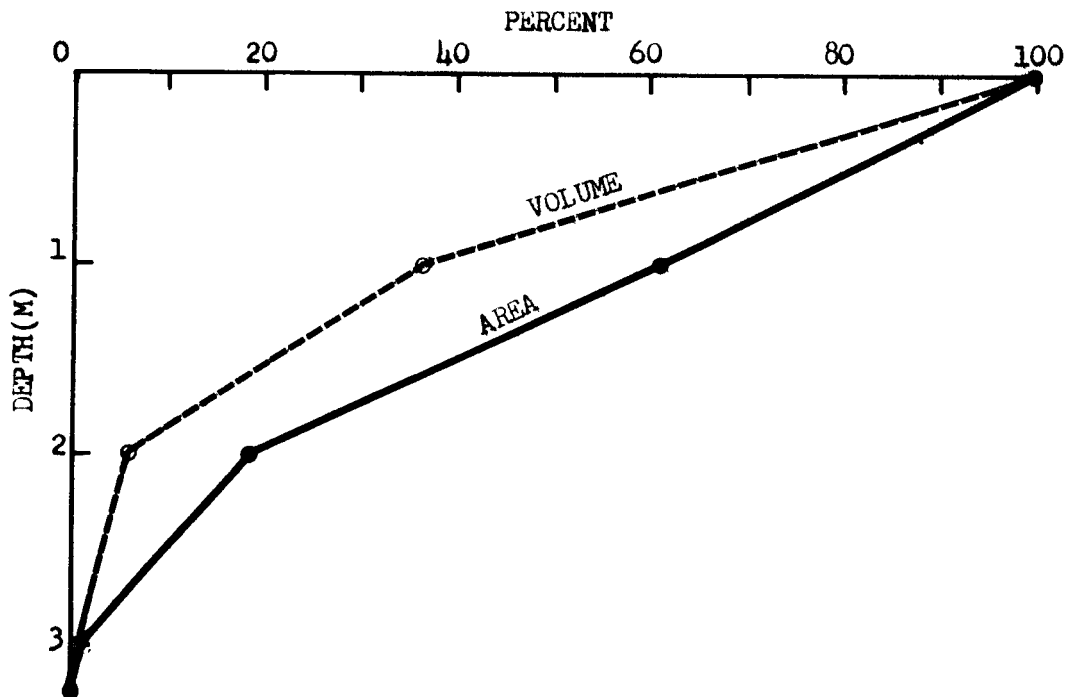


Figure 10. Area and volume depth curves, Baldwin Lake (C23c), Cape Breton Highlands National Park, Nova Scotia.

Figure 11. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Baldwin Lake, C23c, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: July 29, 1976
Elevation: 490 m
Surface area: 44.4 ha
Mean depth: 1.2 m
Flushing rate: 11/yr
Water retention: 0.09 yr.
Index of basin permanence: 0.11



Baldwin Lake
C 23 c

Contours in meters
 † Direction of Flow
 + Deep Station



Meters



Table 18. Glasgow Lake, C24g. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Glasgow Lake Drainage reference # C24g
 Lat. 46° 49' 10" Long. 60° 29' 30"
 UTM grid: _____
 Elevation: 1350 ft 410 m Air distance from sea: 5.6 km
 Drainage system: Glasgow Brook Reference # C24
 Drainage system area: 7.8 km²
 Total lake drainage area: 1.43 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 24.3 hectares Island area: 0.4 hectares
 Water surface area: 23.9 hectares No. of islands: 2
 Maximum length: 0.82 km Max. effective length: 0.82 km
 Maximum width: 0.42 km Max. effective width: 0.42 km
 Maximum depth: 14.6 m Mean depth: 4.45 m
 Shore length: 2.48 km Shoreline development: 1.43
 Lake volume: 1057. x 10³m³ Flushing rate: 2.16 x/year
 Basin permanence index: 0.43
 Inlets: _____ Outlet: _____

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
				<u>C24f</u>

Access: road, trail, water; remote, transitional, ready

Developments:

Map Code: S.M. CB114(d)

Table 19. Surface area, stratum interface areas, stratum volumes and total volume of Glasgow Lake (C24g), Cape Breton Highlands National Park, Nova Scotia.

Glasgow Lake C24g

Depth meters	Area		Stratum meters	Volume	
	hectares	% of total		m ³ x 10 ³	% of total
0	23.9	100.	0-2	407.0	38.5
2	17.0	71.0	2-4	302.3	28.6
4	13.6	56.9	4-6	198.7	18.8
6	7.4	31.0	6-8	90.9	8.6
8	2.7	11.3	8-10	34.9	3.3
10	1.1	4.8	10-12	16.9	1.6
12	0.6	2.6	12-14	6.3	0.6
14	0.1	0.4	14-14.6	0.2	0.02
Mean depth = 4.45m			Total	1057.1	

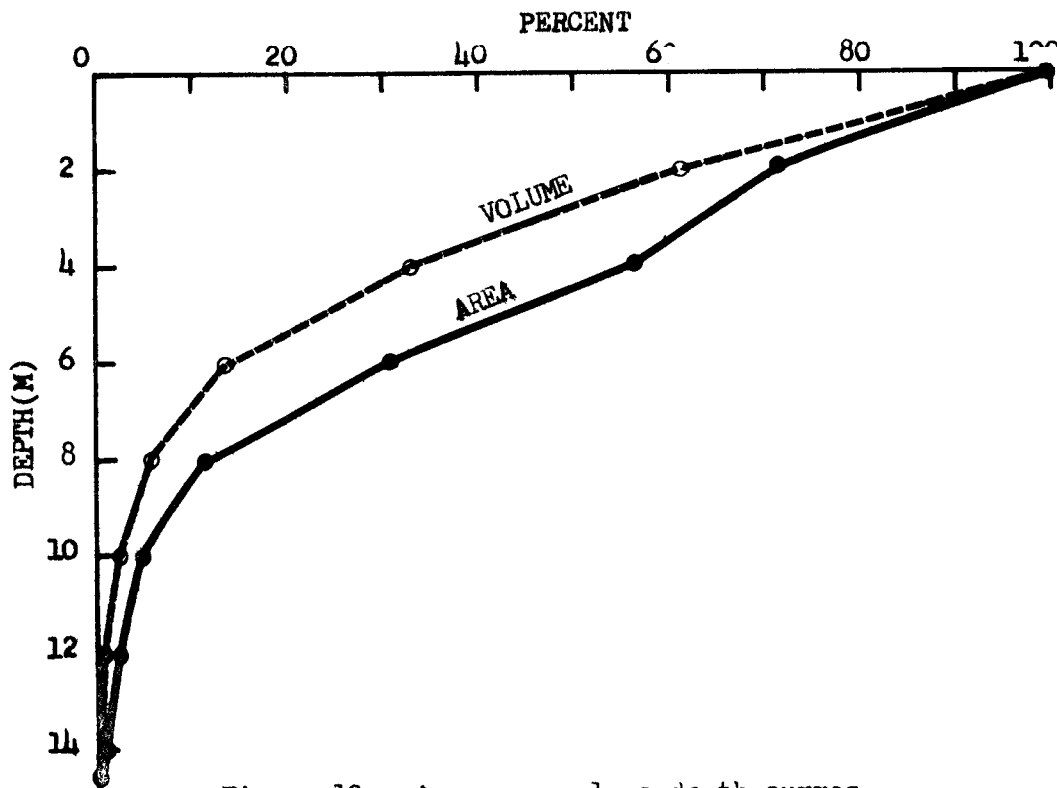


Figure 12. Area and volume depth curves, Glasgow Lake (C24g), Cape Breton Highlands National Park, Nova Scotia.

Figure 13. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Glasgow Lake, C24g, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: Oct. 8, 1976
Elevation: 410 m
Surface area: 23.9 ha
Mean depth: 4.4 m
Flushing rate: 2.2/yr
Water retention: 0.46 yr.
Index of basin permanence: 0.43



Glasgow Lake
C 24 g

Contours in meters
↑ Direction of Flow
+ Deep Station

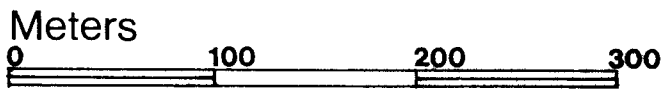


Table 20. Paquette Lake, C25.2.1a. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Paquette Lake Drainage reference # C25.2.1a
 Lat. 46° 50' 00" Long. 60° 25' 50"
 UTM grid: 958896
 Elevation: 850 ft 259 m Air distance from sea: 4.0 km
 Drainage system: Effies Brook Reference # C25
 Drainage system area: 13.0 km²
 Total lake drainage area: 0.58 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 5.02 hectares Island area: _____ hectares
 Water surface area: 5.02 hectares No. of islands: 0
 Maximum length: 0.45 km Max. effective length: 0.45 km
 Maximum width: 0.19 km Max. effective width: 0.19 km
 Maximum depth: 1.9 m Mean depth: 0.91 m
 Shore length: 1.21 km Shoreline development: 1.52
 Lake volume: 45.9 x 10³ m³ Flushing rate: 20.2 x/year
 Basin permanence index: 0.04
 Inlets: Outlet:

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
				<u>C25.2.1</u>

Access: road, trail, water; remote, transitional. ready

Developments:

Map Code: S.M. CB114(d)

Table 21. Surface area, stratum interface areas, stratum volumes and total volume of Paquette Lake (C25.2.1a), Cape Breton Highlands National Park, Nova Scotia.

Paquette Lake C25.2.1a

Depth meters	Area		Stratum meters	Volume	
	hectares	% of total		m ³ x 10 ³	% of total
0	5.0	100.	0-1	36.3	79.1
1.0	2.4	47.8	1-1.5	8.5	18.5
1.5	1.1	21.9	1.5-1.8	1.1	2.4
Mean depth = 0.91m			Total	45.9	

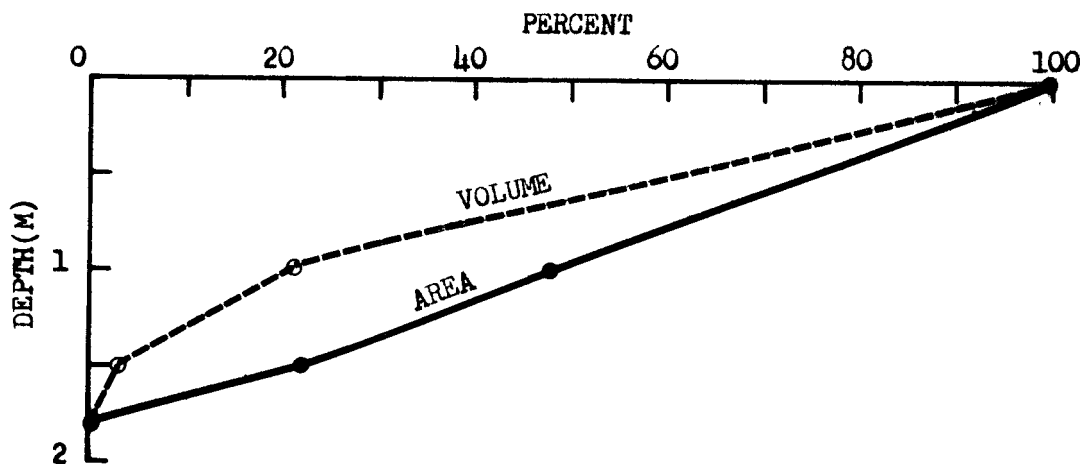
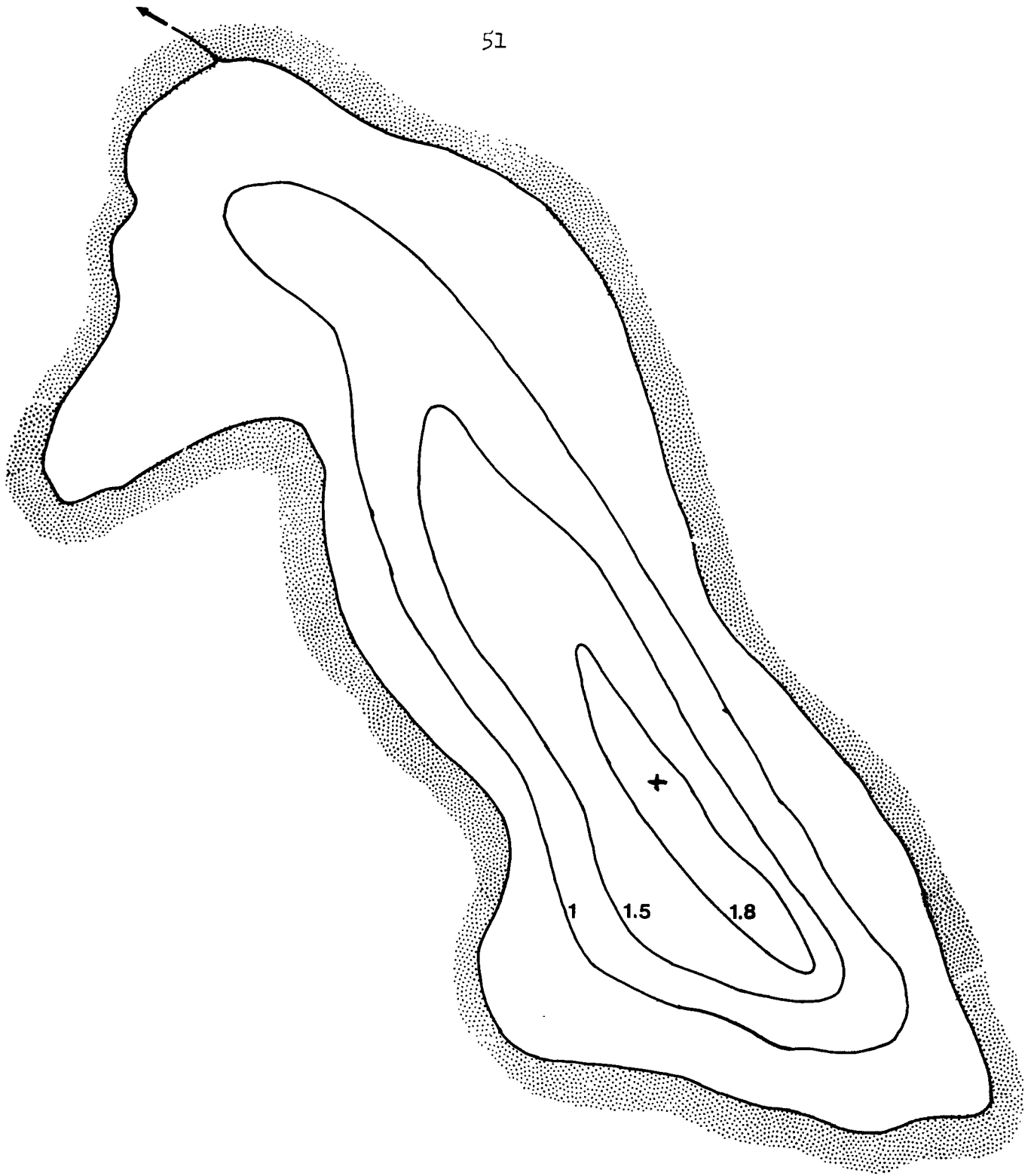


Figure 14. Area and volume depth curves, Paquette Lake (C25.2.1a), Cape Breton Highlands National Park, Nova Scotia.

Figure 15. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Paquette Lake, C25.2.1a, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: April 14, 1973
Elevation: 260 m
Surface area: 5.0 ha
Mean depth: 0.91 m
Flushing rate: 20/yr
Water retention: 0.05 yr.
Index of basin permanence: 0.04



**Paquette Lake
C 25.2.1a**

Contours in meters
↑ Direction of Flow
+ Deep Station



Meters



Table 22. Long Lake, C33a. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Long Lake Drainage reference # C33a
 Lat. 46° 48' 43" Long. 60° 29' 24"
 UTM grid: _____
 Elevation: 1350 ft 410 m Air distance from sea: 6.5 km
 Drainage system: Halfway Brook Reference # C33
 Drainage system area: 34.1 km²
 Total lake drainage area: 5.05 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 6.6 hectares Island area: _____ hectares
 Water surface area: 6.6 hectares No. of islands: 0
 Maximum length: 0.64 km Max. effective length: 0.64 km
 Maximum width: 0.18 km Max. effective width: 0.18 km
 Maximum depth: 1.5 m Mean depth: 0.62 m
 Shore length: 1.62 km Shoreline development: 1.78
 Lake volume: 40.9 x 10³ m³ Flushing rate: 198. x/year
 Basin permanence index: 0.03
 Inlets: _____ Outlet: _____

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
Halfway Brook	C33		Halfway Brook	C33

Access: road, trail, water; remote, transitional, ready

Developments:

Map Code: S.M. CB114(d)

Table 23. Surface area, stratum interface areas, stratum volumes and total volume of Long Lake (C33a), Cape Breton Highlands National Park, Nova Scotia.

Long Lake C33a

Depth meters	Area		Stratum meters	Volume	
	Hectares	% of total		m ³ x 10 ³	% of total
0	6.6	100.	0-1	38.2	93.4
1	1.6	24.2	1-1.5	2.7	6.6
Mean depth = 0.62			Total	40.9	

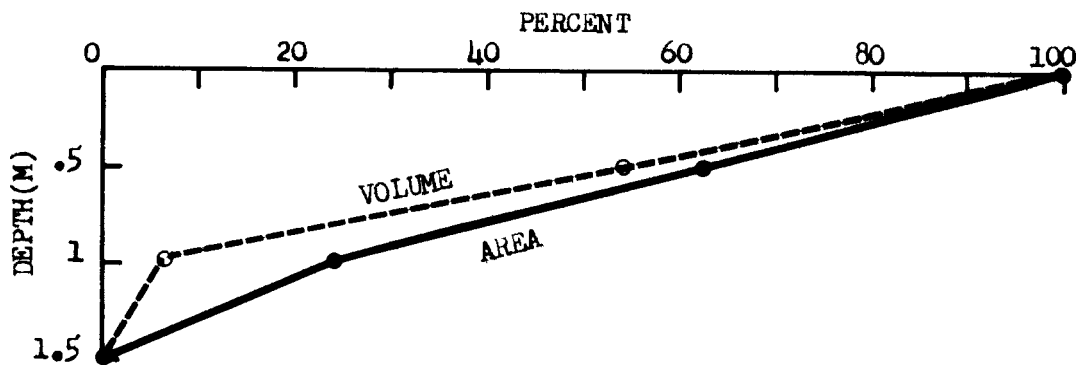
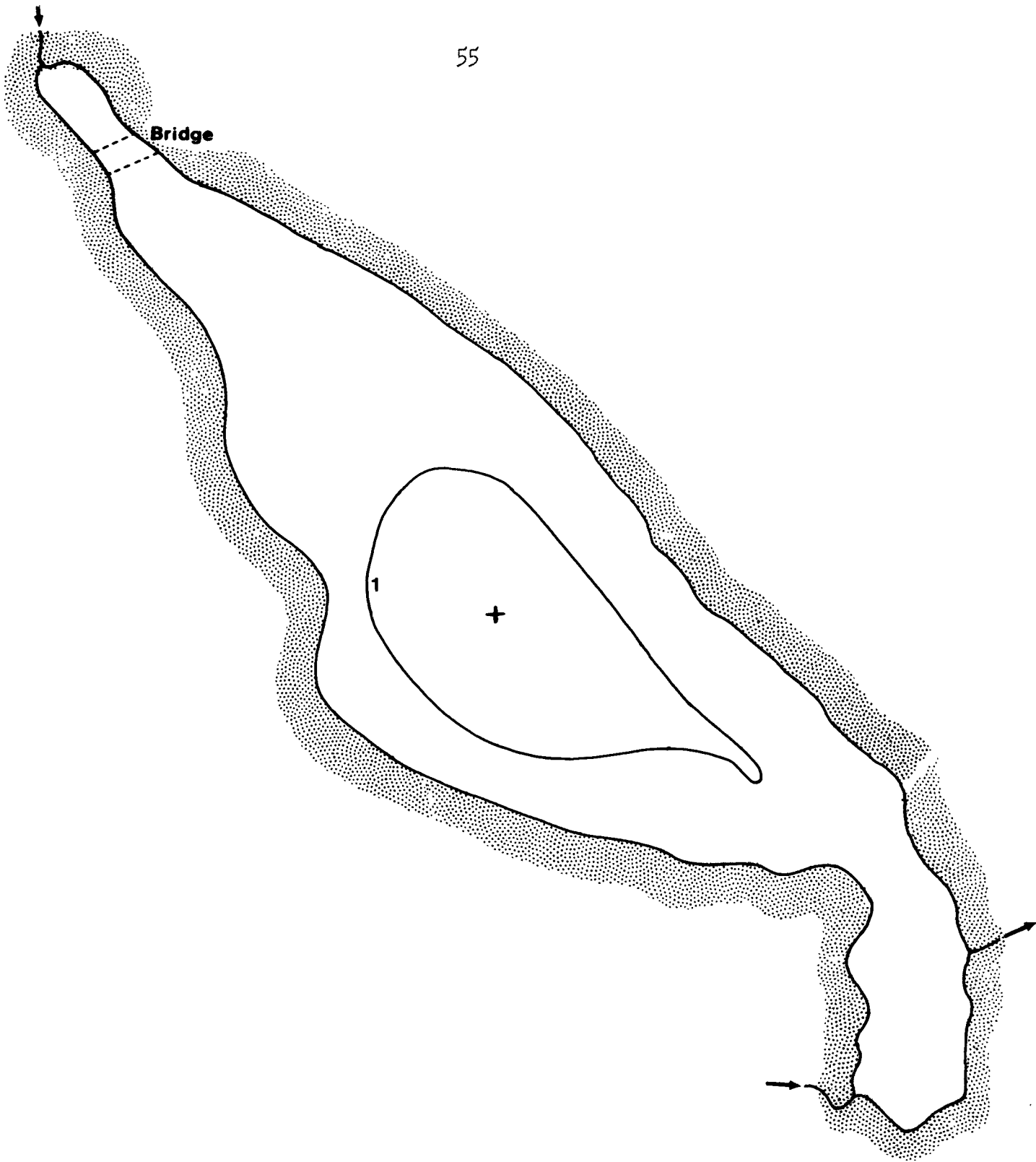


Figure 16. Area and volume depth curves, Long Lake (C33a), Cape Breton Highlands National Park, Nova Scotia.

Figure 17. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Long Lake, C33a, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: Oct. 6, 1976
Elevation: 410 m
Surface area: 6.6 ha
Mean depth: 0.62 m
Flushing rate: 198/yr
Water retention: 0.005 yr.
Index of basin permanence: 0.03



**Long Lake
C 33 a**

Contours in meters
↑ Direction of Flow
+ Deep Station



Meters

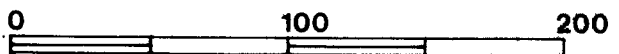


Table 24. Round Lake, C33b. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Round Lake Drainage reference # C33b
 Lat. 46° 48' 22" Long. 60° 30' 30"
 UTM grid: _____
 Elevation: 1400 ft 430 m Air distance from sea: 7.5 km
 Drainage system: Halfway Brook Reference # C33
 Drainage system area: 34.1 km²
 Total lake drainage area: 3.70 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 14.5 hectares Island area: 0.1 hectares
 Water surface area: 14.4 hectares No. of islands: 1
 Maximum length: 0.55 km Max. effective length: 0.55 km
 Maximum width: 0.35 km Max. effective width: 0.35 km
 Maximum depth: 2.0 m Mean depth: 0.97 m
 Shore length: 1.6 km Shoreline development: 1.19
 Lake volume: 140. x 10³ m³ Flushing rate: 42.3 x/year
 Basin permanence index: 0.09

Inlets:

Name	Reference #	Drainage area km ²
Halfway Brook	C33 C33b1	

Outlet:

Name	Reference #
Halfway Brook	C33

Access: road, trail, water; remote, transitional, ready

Developments: Emergency Cabin

Map Code: S.M. CB115(d)

Table 25. Surface area, stratum interface areas, stratum volumes and total volume of Round Lake (C33b), Cape Breton Highlands National Park, Nova Scotia.

Round Lake C33b

Depth meters	Area		Stratum meters	Volume	
	hectares	% of total		m ³ x 10 ³	% of total
0	14.4	100.	0-1	112.1	80.2
1	8.3	57.6	1-2	27.7	19.8
Mean depth = 0.97m			Total	139.8	

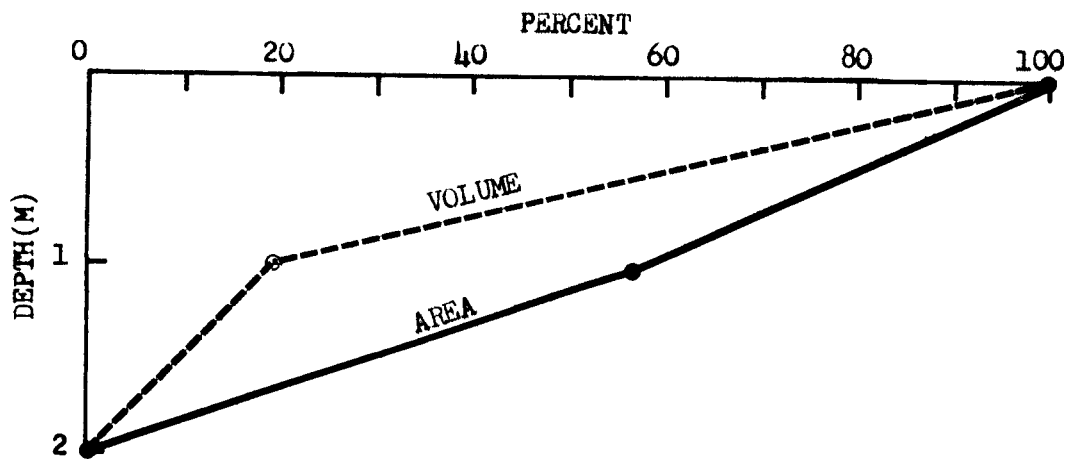
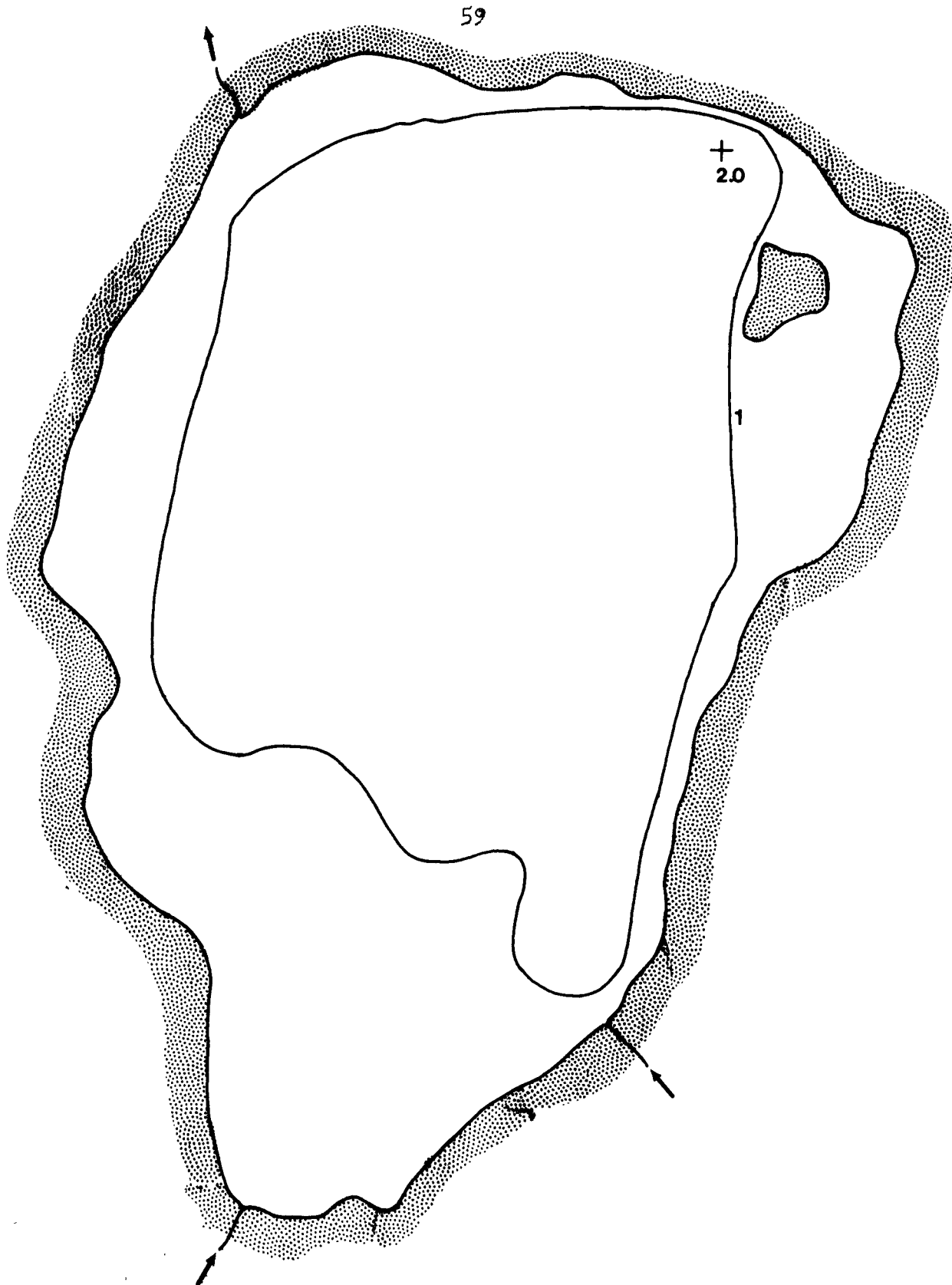


Figure 18. Area and volume depth curves, Round Lake (C33b), Cape Breton Highlands National Park, Nova Scotia.

Figure 19. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Round Lake, C33b, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: Oct. 4, 1976
Elevation: 430 m
Surface area: 14.4 ha
Mean depth: 0.97 m
Flushing rate: 42/yr
Water retention: 0.02 yr.
Index of basin permanence: 0.09



**Round Lake
C33 b**

Contours in meters
↑ Direction of Flow
+ Deep Station



Meters



Table 26. Lobster Lake, C33e. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Lobster Lake Drainage reference # C33e
 Lat. 46 ° 48 ' 06 " Long. 60 ° 31 ' 23 "
 UTM grid: _____
 Elevation: 1450 ft 440 m Air distance from sea: 8.5 km
 Drainage system: Halfway Brook Reference # C33
 Drainage system area: 34.1 km²
 Total lake drainage area: 1.65 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 9.6 hectares Island area: 0.1 hectares
 Water surface area: 9.5 hectares No. of islands: 1
 Maximum length: 0.80 km Max. effective length: 0.80 km
 Maximum width: 0.24 km Max. effective width: 0.24 km
 Maximum depth: 1.88 m Mean depth: 1.01 m
 Shore length: 1.97 km Shoreline development: 1.80
 Lake volume: 95.9 x 10³ m³ Flushing rate: 27.5 x/year
 Basin permanence index: 0.05
 Inlets: _____ Outlet: _____

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
Halfway Brook	C33e1 C33		Halfway Brook	C33

Access: road, trail, water; remote, transitional, ready

Developments:

Map Code: S.M. CB115(d)

Table 27. Surface area, stratum interface areas, stratum volumes and total volume of Lobster Lake (C33e), Cape Breton Highlands National Park, Nova Scotia.

Lobster Lake C33e

Depth meters	Area		Stratum meters	Volume	
	hectares	% of total		m ³ x 10 ³	% of total
0	9.5	100.	0-1	77.5	80.8
1	6.1	64.4	1-1.9	18.4	19.2
Mean depth = 1.01m				95.9	

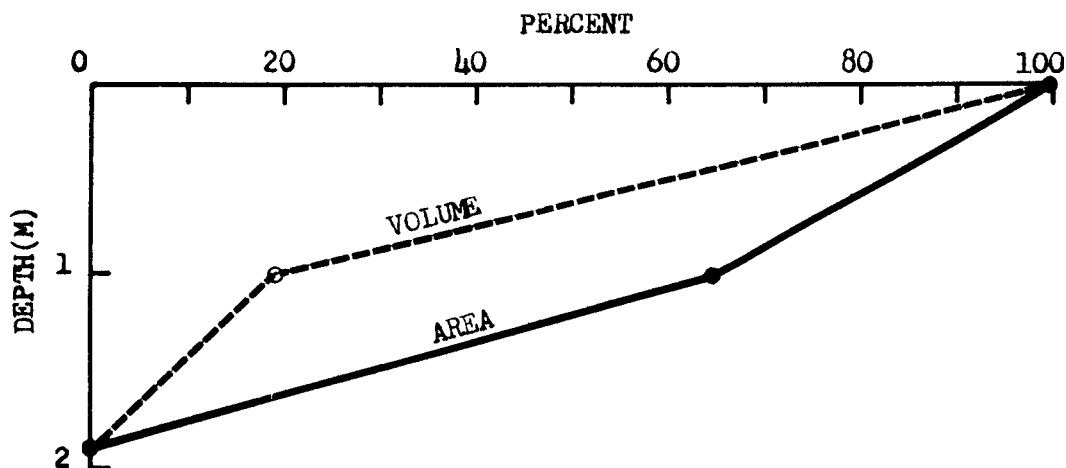
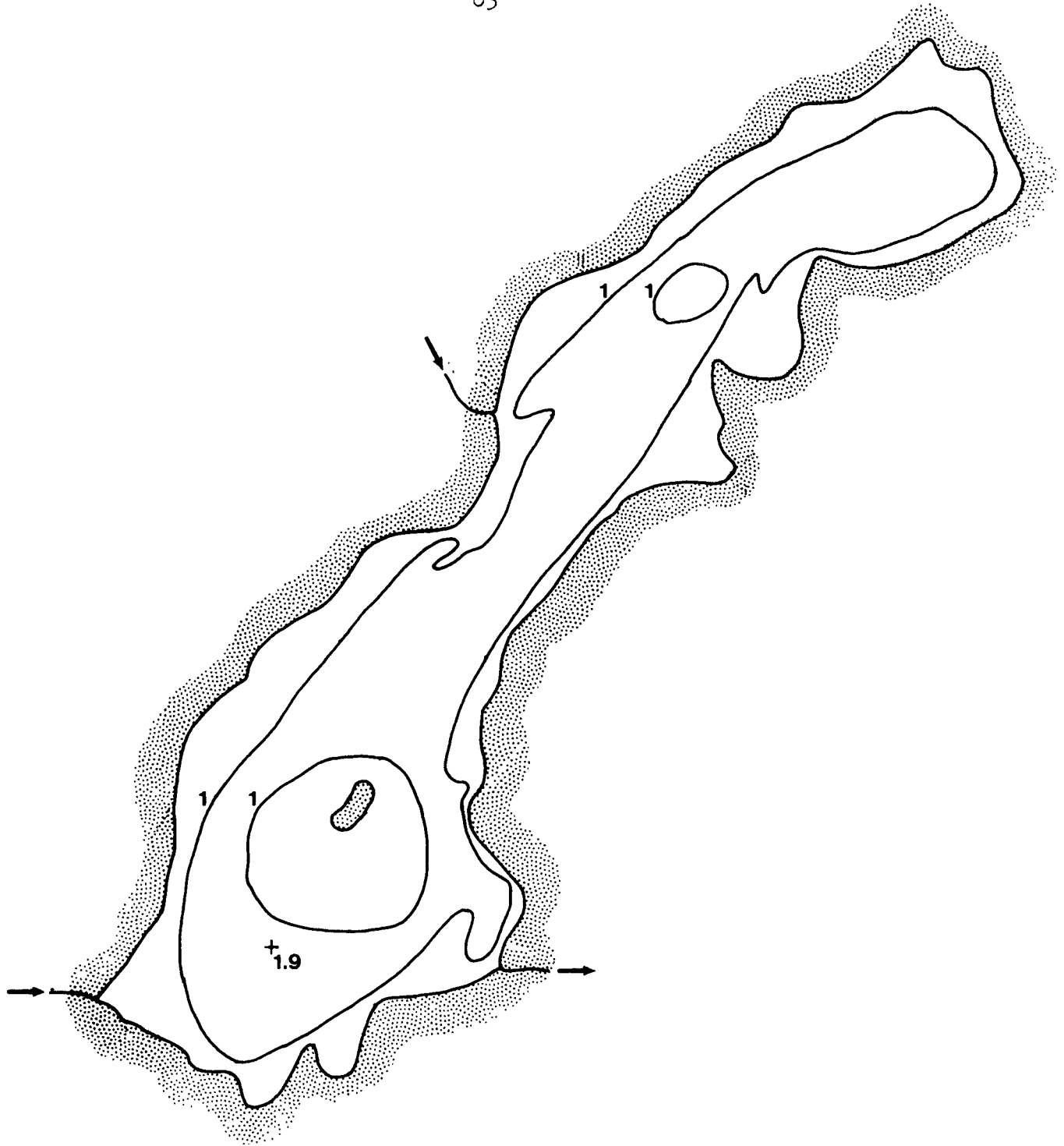


Figure 20. Area and volume depth curves, Lobster Lake (C33e), Cape Breton Highlands National Park, Nova Scotia.

Figure 21. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Lobster Lake, C33e, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: Oct. 5, 1976
Elevation: 440 m
Surface area: 9.5 ha
Mean depth: 1.0 m
Flushing rate: 27.5/yr
Water retention: 0.04 yr.
Index of basin permanence: 0.05



Lobster Lake
C 33 e

Contours in meters
↑ Direction of Flow
+ Deep Station



Meters



Table 28. Jigging Cove Lake, C34a. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Jigging Cove Lake Drainage reference # C34a
 Lat. 46° 47' 20" Long. 60° 20' 30"
 UTM grid: 029850
 Elevation: 100 ft 30 m Air distance from sea: 1.5 km
 Drainage system: _____ Reference # C34
 Drainage system area: 7.5 km²
 Total lake drainage area: 1.18 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 6.2 hectares Island area: _____ hectares
 Water surface area: 6.2 hectares No. of islands: 0
 Maximum length: 0.74 km Max. effective length: 0.74 km
 Maximum width: 0.18 km Max. effective width: 0.18 km
 Maximum depth: 2.0 m Mean depth: 0.89 m
 Shore length: 1.49 km Shoreline development: 1.69
 Lake volume: 55.3 x 10³ m³ Flushing rate: 34.1 x/year
 Basin permanence index: 0.037

Inlets:

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Outlet:</u>	<u>Reference #</u>
				<u>C34</u>

Access: road, trail water; remote, transitional, ready

Developments: dam, circumferential trail

Map Code: A.P. A23305-2

Table 29. Surface area, stratum interface areas, stratum volumes and total volume of Jigging Cove Lake (C34a), Cape Breton Highlands National Park, Nova Scotia.

Jigging Cove Lake C34a

Depth meters	Area		Stratum meters	Volume	
	hectares	% of total		m ³ x 10 ³	% of total
0	6.2	100.	0-1	42.7	77.2
1	2.6	41.9	1-2	12.6	22.8
2	0.3	4.8			
Mean depth = 0.89m			Total	55.3	

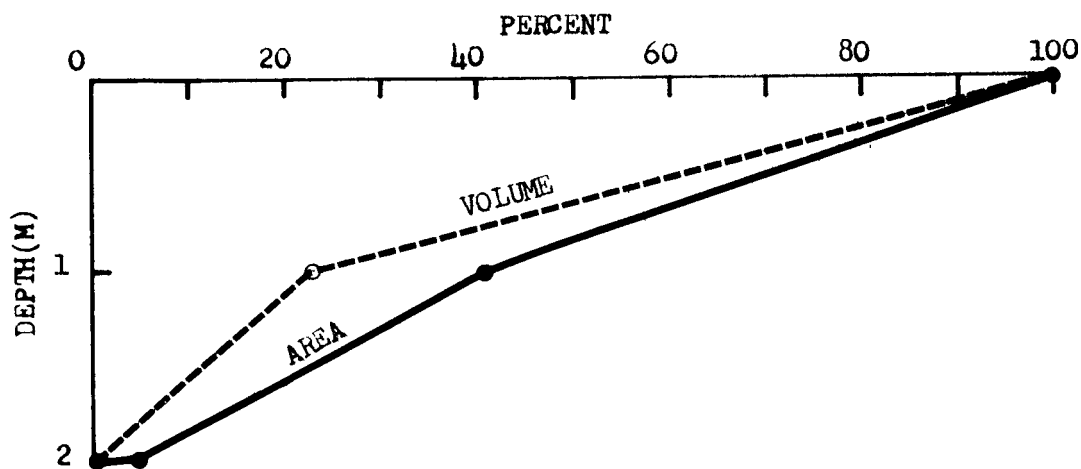
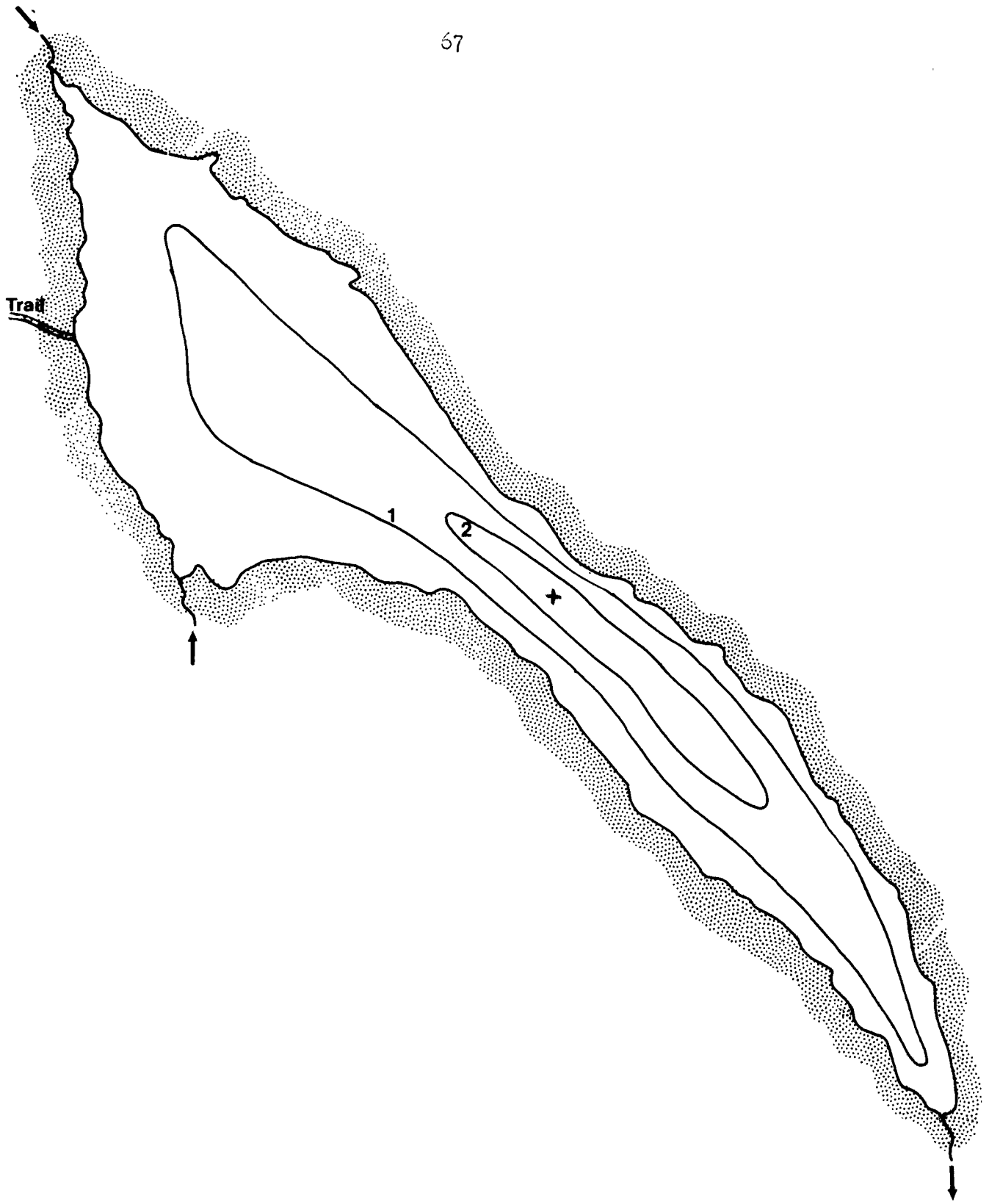


Figure 22. Area and volume depth curves, Jigging Cove Lake (C34a), Cape Breton Highlands National Park, Nova Scotia.

Figure 23. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Jigging Cove Lake, C34a, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: April 10, 1973
Elevation: 45 m
Surface area: 6.2 ha
Mean depth: 0.89 m
Flushing rate: 34/yr
Water retention: 0.03 yr.
Index of basin permanence: 0.04



**Jigging Cove Lake
C 34 a**

Contours in meters
↑ Direction of Flow
+ Deep Station



Meters

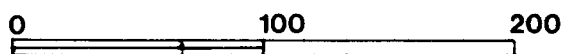


Table 30. Branch Pond, C36.1b. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Branch Pond Lake Drainage reference # C36.1b
 Lat. 46° 44' 30" Long. 60° 27' 15"
 UTM grid: 944794
 Elevation: 950 ft 290 m Air distance from sea: 7.7 km
 Drainage system: Black Brook Reference # C36
 Drainage system area: 67.4 km²
 Total lake drainage area: 5.43 km²
 Lake drainage area outside park: km² = % of total
 Lake area: 14.9 hectares Island area: hectares
 Water surface area: 14.9 hectares No. of islands: 0
 Maximum length: 0.69 km Max. effective length: 0.69 km
 Maximum width: 0.32 km Max. effective width: 0.32 km
 Maximum depth: 6.5 m Mean depth: 2.43 m
 Shore length: 1.61 km Shoreline development: 1.18
 Lake volume: 363. x 10³ m³ Flushing rate: 24.0 x/year
 Basin permanence index: 0.23
 Inlets: Outlet:

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
Mary Ann Brook	C36.1		Mary Ann Brook	C36.1

Access: road, trail, water; remote, transitional, ready

Developments:

Map Code: A.F. A23309-134

Table 31. Surface area, stratum interface areas, stratum volumes and total volume of Branch Pond (C36.1b), Cape Breton Highlands National Park, Nova Scotia.

Branch Pond C36.1b

Depth	Area		Stratum	Volume	
	hectares	% of total		meters	m ³ x 10 ³
0	14.9	100.	0-1	132.7	36.6
1	11.7	78.4	1-2	102.6	28.3
2	8.8	59.3	2-3	67.4	18.6
3	4.8	32.5	3-4	35.2	9.7
4	2.3	15.8	4-5	17.0	4.7
5	1.1	7.4	5-6	6.5	1.8
6	0.3	2.0	6-6.5	1.1	0.3
6.5	0.1	0.9			
Mean depth = 2.43m			Total	<u>362.5</u>	

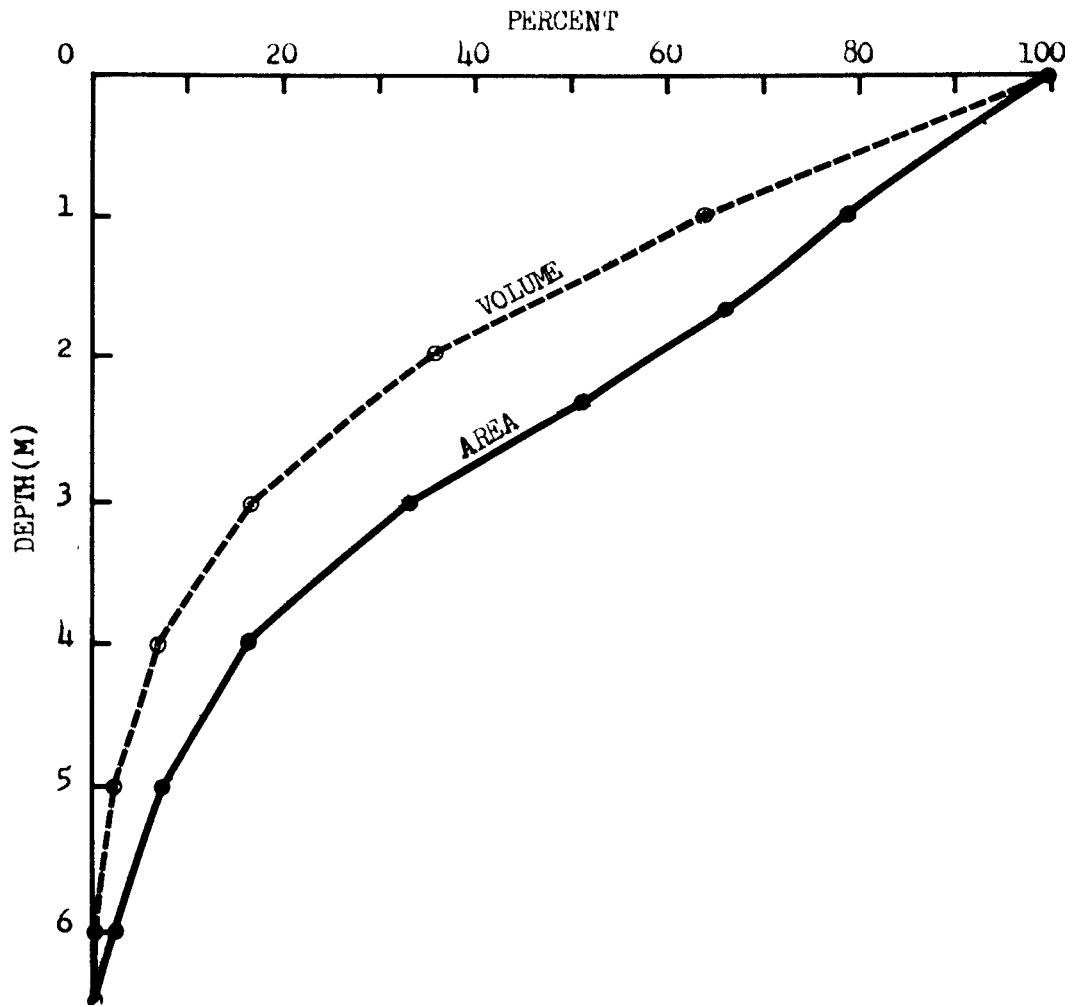


Figure 24. Area and volume depth curves, Branch Pond (C36.lb), Cape Breton Highlands National Park, Nova Scotia.

Figure 25. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Branch Pond, C36.lb, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: July 1, 1976
Elevation: 305 m
Surface area: 14.9 ha
Mean depth: 2.4 m
Flushing rate: 24/yr
Water retention: 0.04 yr.
Index of basin permanence: 0.23



**Branch Pond
C36.1b**

Contours in meters
↑ Direction of Flow
+ Deep Station



Meters

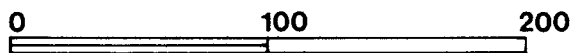


Table 32. Warren Lake, C38a. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Warren Lake Drainage reference # C38a
 Lat. 46° 42' 50" Long. 60° 23' 40"
 UTM grid: 990764
 Elevation: 50 ft 15 m Air distance from sea: 2.8 km
 Drainage system: Warren Brook Reference # C38
 Drainage system area: 34. km²
 Total lake drainage area: 32.4 km²
 Lake drainage area outside park: 0.40 km² = 1.2 % of total
 Lake area: 89.8 hectares Island area: hectares
 Water surface area: 89.8 hectares No. of islands: 0
 Maximum length: 1.95 km Max. effective length: 1.95 km
 Maximum width: 0.59 km Max. effective width: 0.59 km
 Maximum depth: 31. m Mean depth: 15.9m
 Shore length: 4.96 km Shoreline development: 14.76
 Lake volume: 14298. x 10³m³ Flushing rate: 3.63 x/year
 Basin permanence index: 2.88

Inlets:

Name	Reference #	Drainage area km ²
Warren Brook	C38 C38a2 C38a3	

Outlet:

Name	Reference #
Warren Brook	C38

Access: road, trail, water; remote, transitional, ready

Developments: Day Use Area, circumferential trail

Table 33. Surface area, stratum interface areas, stratum volumes and total volume of Warren Lake (C38a), Cape Breton Highlands National Park, Nova Scotia.

Warren Lake C38a

Depth	Area		Stratum	Volume	
	hectares	% of total		meters	m ³ x 10 ³
0	89.8	100.	0-5	3949.6	27.6
5	71.2	79.3	5-10	3292.0	23.0
10	60.6	67.5	10-15	2722.2	19.0
15	47.7	53.1	15-20	2063.5	14.4
20	34.7	38.7	20-25	1477.1	10.3
25	23.8	26.5	25-30	774.5	5.4
30	5.8	6.4	30-31	19.3	0.1
Mean depth = 15.9m			Total	14298.2	

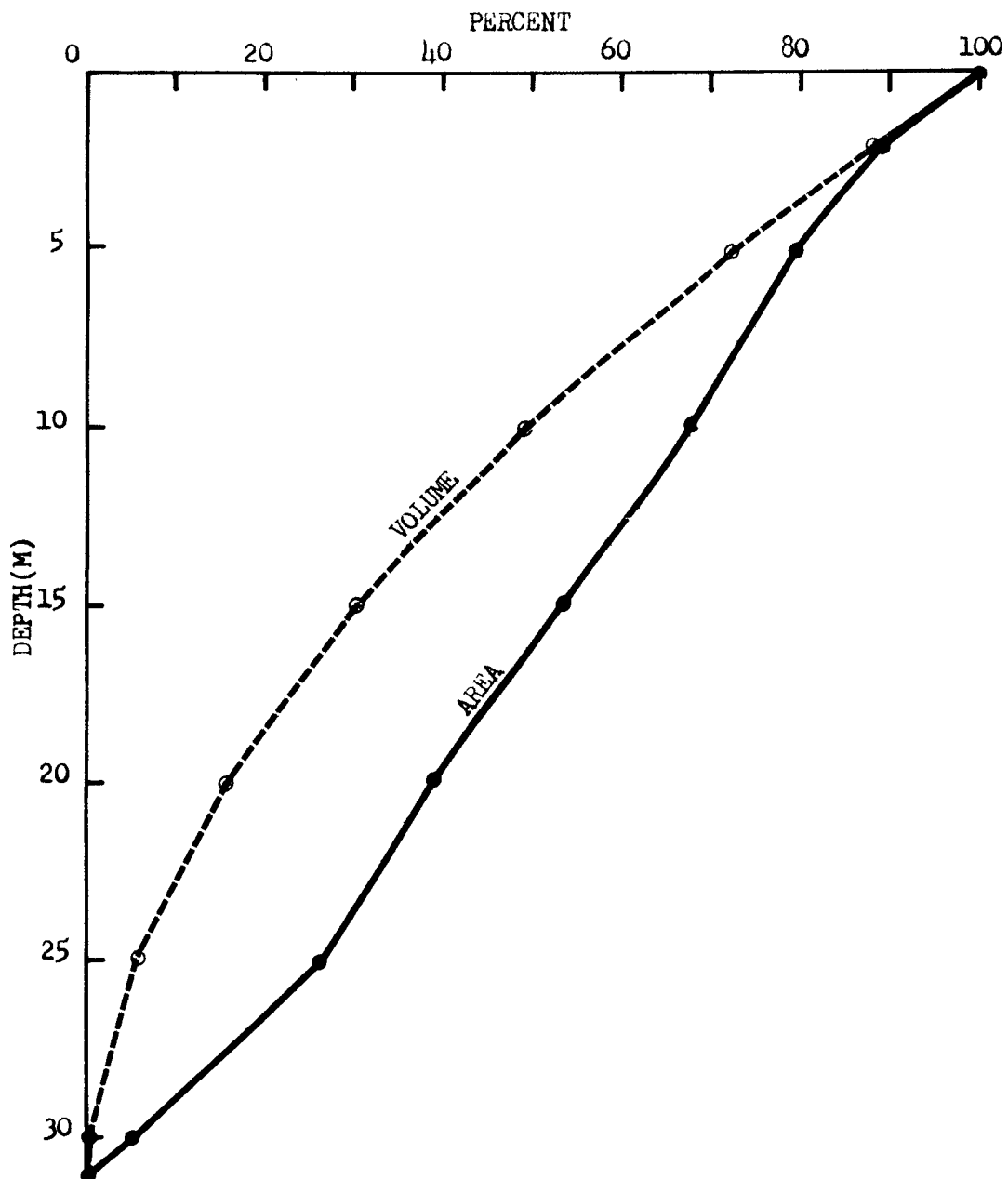
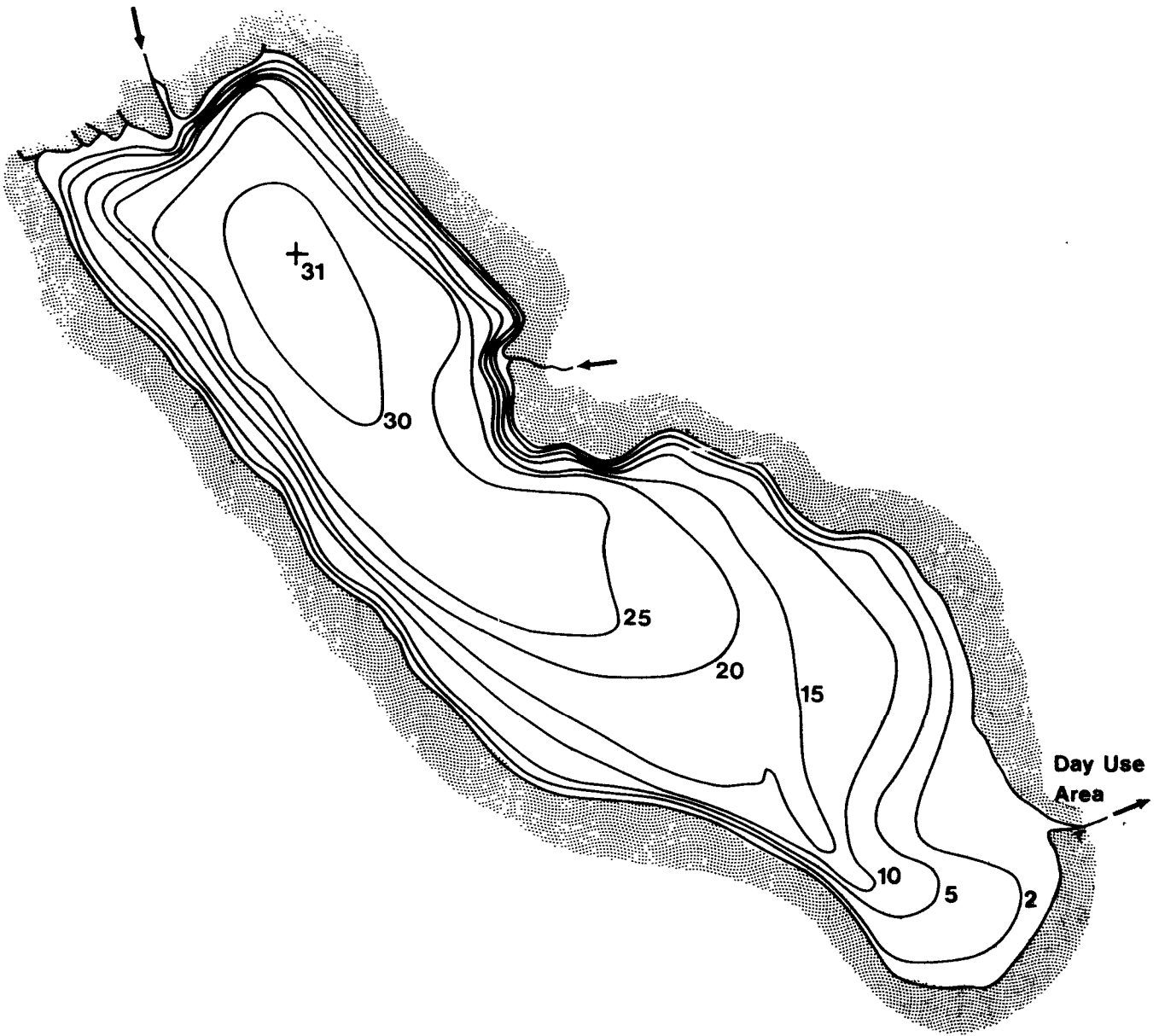


Figure 26. Area and volume depth curves, Warren Lake (C38a), Cape Breton Highlands National Park, Nova Scotia.

Figure 27. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Warren Lake, C38a, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: June 29, 1976
Elevation: 15 m
Surface area: 89.8 ha
Mean depth: 15.9 m
Flushing rate: 3.6/yr
Water retention: 0.28 yr.
Index of basin permanence: 2.88



**Warren Lake
C.38.a**

Contours in meters
↑ Direction of Flow
+ Deep Station

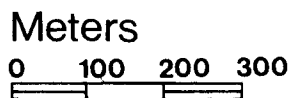


Table 34. Dundas #3 Lake, C41c. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Dundas #3 Lake Drainage reference # C41c
 Lat. 46° 42' 50" Long. 60° 32' 20"
 UTM grid: _____
 Elevation: 1450 ft 440 m Air distance from sea: 10.9 km
 Drainage system: Dundas Brook Reference # C41
 Drainage system area: 23.2 km²
 Total lake drainage area: 5.98 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 13.0 hectares Island area: 0 hectares
 Water surface area: 13.0 hectares No. of islands: 0
 Maximum length: 0.88 km Max. effective length: 0.88 km
 Maximum width: 0.26 km Max. effective width: 0.26 km
 Maximum depth: 2.1 m Mean depth: 0.87 m
 Shore length: 3.48 km Shoreline development: 2.72
 Lake volume: 113. x 10³ m³ Flushing rate: .84.7 x/year
 Basin permanence index: 0.03
 Inlets: Outlet:

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
Dundas Brook	C41		Dundas Brook	C41

Access: road, trail, water; remote, transitional, ready

Developments:

Map Code: A.P. A23309-119

Table 35. Surface area, stratum interface areas, stratum volumes and total volume of Dundas #3 Lake (C41c), Cape Breton Highlands National Park, Nova Scotia.

Dundas #3 Lake C41c

Depth meters	Area		Stratum meters	Volume	
	Hectares	% of total		m ³ x 10 ³	% of total
0	13.0	100.	0-1	90.2	79.7
1	5.6	42.7	1-2	22.8	20.2
2	0.2	1.6	2-2.1	0.07	0.06
Mean depth = 0.87m			Total	113.1	

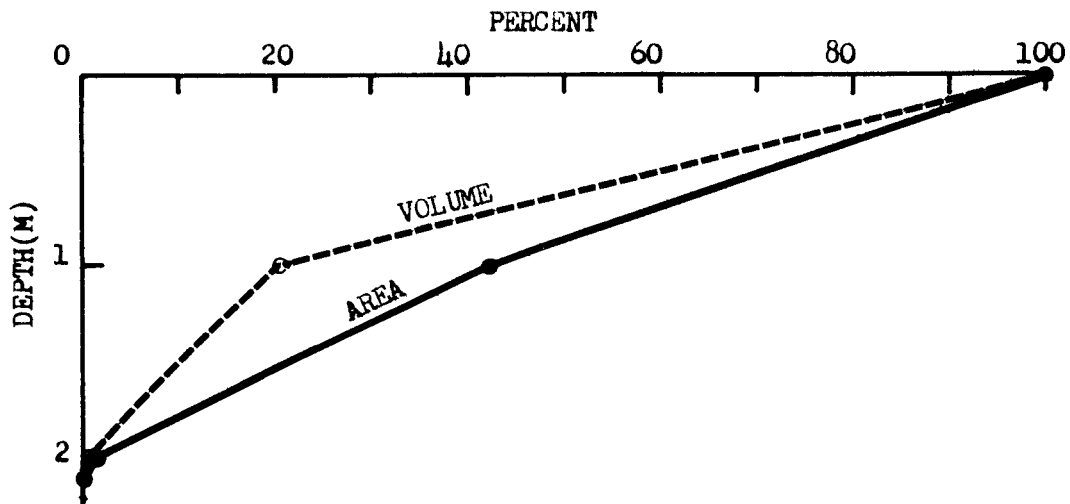


Figure 28. Area and volume depth curves, Dundas #3 Lake (C41c), Cape Breton Highlands National Park, Nova Scotia.

Table 36. Dundas #4 Lake, C4ld. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Dundas #4 Lake Drainage reference # C4ld
 Lat. 46° 42' 37" Long. 60° 32' 50"
 UTM grid: _____
 Elevation: 1450 ft 440 m Air distance from sea: 11.2 km
 Drainage system: Dundas Brook Reference # C41
 Drainage system area: 23.2 km²
 Total lake drainage area: 4.73 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 16.3 hectares Island area: _____ hectares
 Water surface area: 16.3 hectares No. of islands: 0
 Maximum length: 0.59 km Max. effective length: 0.59 km
 Maximum width: 0.32 km Max. effective width: 0.32 km
 Maximum depth: 2.5 m Mean depth: 1.52 m
 Shore length: 2.26 km Shoreline development: 1.58
 Lake volume: 247. x 10³ m³ Flushing rate: 30.6 x/year
 Basin permanence index: 0.11
 Inlets: Outlet:

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
Dundas Brook	C41		Dundas Brook	C41
	C4ld10			
	C4ld11			

 Access: road, trail, water; remote, transitional, ready
 Developments:
 Map Code: A.P. A23309-117

Table 37. Surface area, stratum interface areas, stratum volumes and total volume of Dundas #4 Lake (C4ld), Cape Breton Highlands National Park, Nova Scotia.

Dundas #4 Lake C4ld

Depth meters	Area		Stratum meters	Volume	
	Hectares	% of total		m ³ x 10 ³	% of total
0	16.3	100.	0-1	138.0	55.8
1	11.5	70.6	1-2	65.4	26.5
2	2.6	16.2	2-2.5	44.0	17.8
Mean depth = 1.52m			Total	247.4	

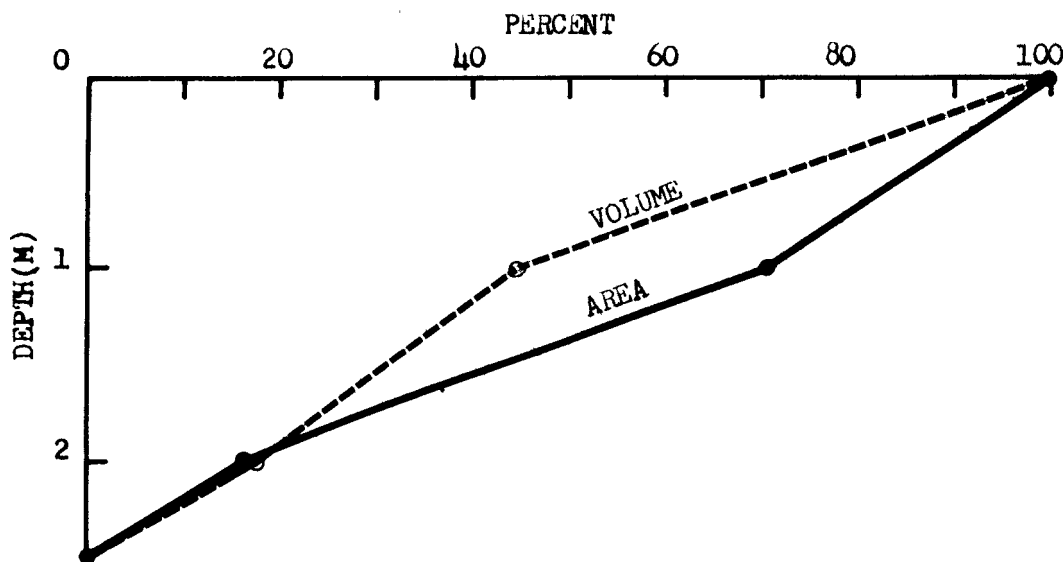


Figure 29. Area and volume depth curves, Dundas #4 Lake (C4ld), Cape Breton Highlands National Park, Nova Scotia.

Table 38. Dundas #5 Lake, C41d10a. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Dundas #5 Lake Drainage reference # C41d10a
 Lat. 46° 42' 25" Long. 60° 32' 32"
 UTM grid: _____
 Elevation: 1450 ft 440 m Air distance from sea: 10.8 km
 Drainage system: Dundas Brook Reference # C41
 Drainage system area: 23.2 km²
 Total lake drainage area: 0.75 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 4.9 hectares Island area: _____ hectares
 Water surface area: 4.9 hectares No. of islands: 0
 Maximum length: 0.29 km Max. effective length: 0.29 km
 Maximum width: 0.25 km Max. effective width: 0.25 km
 Maximum depth: 0.9 m Mean depth: 0.30 m
 Shore length: 0.91 km Shoreline development: 1.16
 Lake volume: 14.5 x 10³ m³ Flushing rate: 82.8 x/year
 Basin permanence index: 0.02
 Inlets: Outlet:

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
				<u>C41d10</u>

Access: road, trail, water; remote, transitional, ready

Developments:

Map Code: A.P. A23309-117

Table 39. Surface area, stratum interface areas, stratum volumes and total volume of Dundas #5 Lake (C4ld10a), Cape Breton Highlands National Park, Nova Scotia.

Dundas #5 Lake C4ld10a

Depth meters	Area		Stratum meters	Volume	
	Hectares	% of total		m ³ x 10 ³	% of total
0	4.84	100.	0-0.9	14.5	100

Mean depth = 0.30m

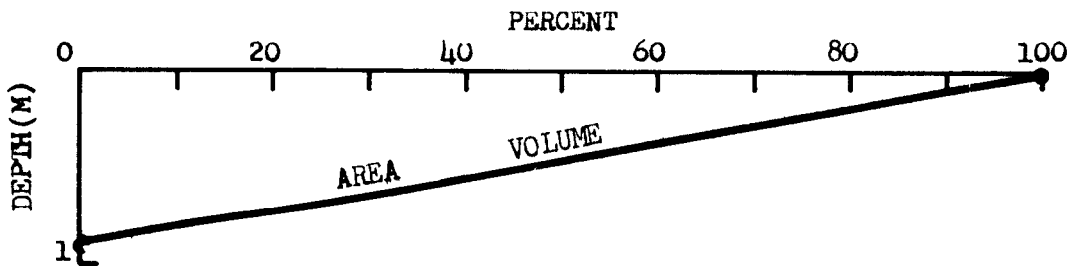


Figure 30. Area and volume depth curves, Dundas #5 Lake (C4ld10a), Cape Breton Highlands National Park, Nova Scotia.

Figure 31. Bathymetric maps, date of sounding, geodetic elevation and selected morphometric features of Dundas #3, #4 and #5 Lakes, C4lc, C4ld and C4ld10a, Cape Breton Highlands National Park, Nova Scotia.

Dundas #3 Lake, C4lc:

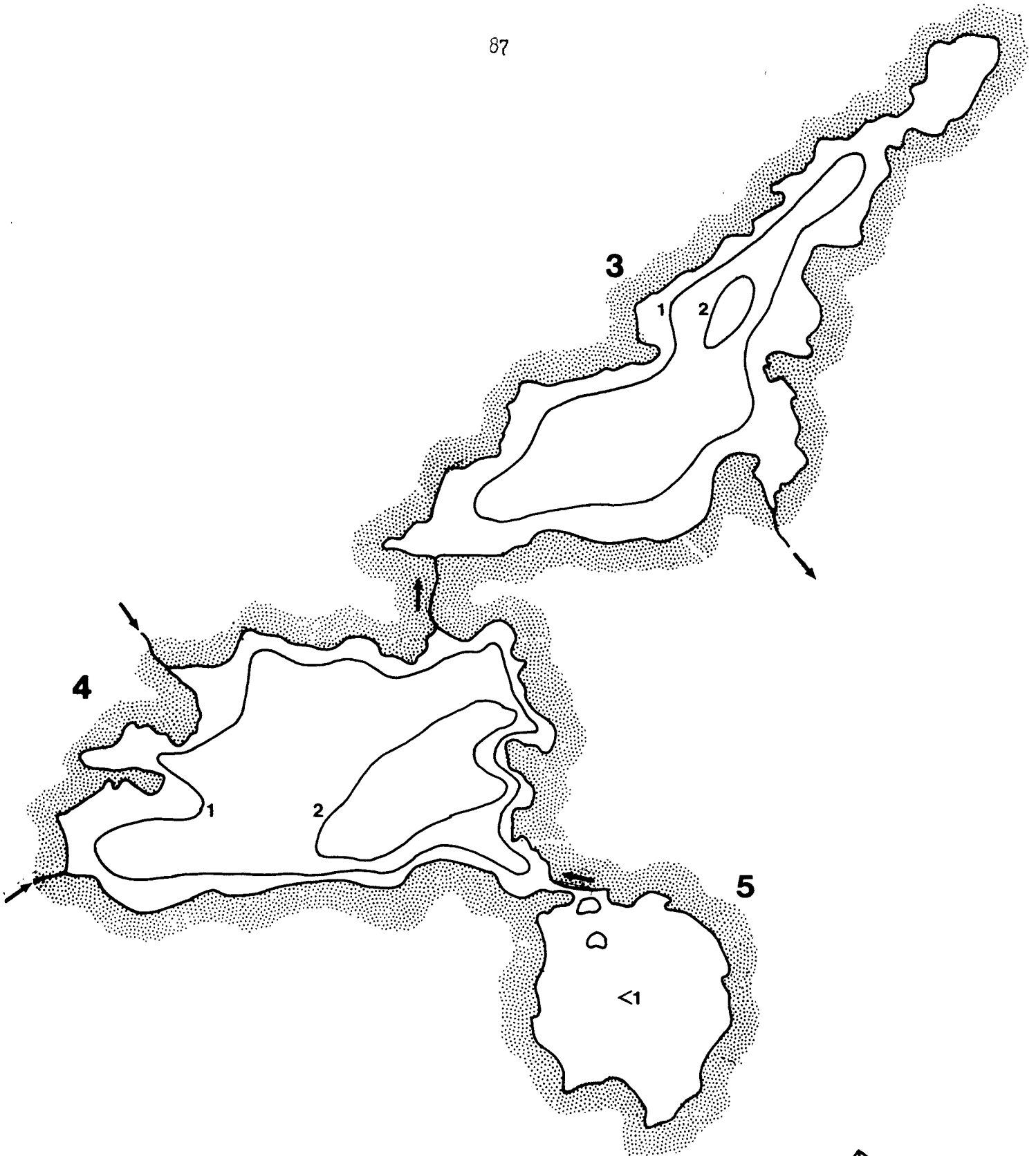
Date of sounding: July 29, 1976
 Elevation: 440 m
 Surface area: 13.0 ha
 Mean depth: 0.9 m
 Flushing rate: 85/yr
 Water retention: 0.01 yr.
 Index of basin permanence: 0.03

Dundas #4 Lake, C4ld:

Date of sounding: July 29, 1976
 Elevation: 440 m
 Surface area: 16.3 ha
 Mean depth: 1.5 m
 Flushing rate: 31/yr
 Water retention: 0.03 yr.
 Index of basin permanence: 0.11

Dundas #5 Lake, C4ld10a:

Date of sounding: July 29, 1976
 Elevation: 440 m
 Surface area: 4.8 ha
 Mean depth: 0.3 m
 Flushing rate: 83/yr
 Water retention: 0.01 yr.
 Index of basin permanence: 0.02



Dundas Lakes 3,4,5
C41c
C41d
C41d 10a

Contours in meters
↑ Direction of Flow
+ Deep Station



Meters



Table 40. Cann's Lake, C42b. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Cann's Lake Drainage reference # C42b
 Lat. 46° 40' 20" Long. 60° 26' 00"
 UTM grid: _____
 Elevation: 700 ft 215 m Air distance from sea: 2.0 km
 Drainage system: _____ Reference # C42
 Drainage system area: 2.20 km²
 Total lake drainage area: 0.82 km²
 Lake drainage area outside park: 0.02 km² = 2.7% of total
 Lake area: 10.5 hectares Island area: 0.1 hectares
 Water surface area: 10.4 hectares No. of islands: 1
 Maximum length: 0.59 km Max. effective length: 0.43 km
 Maximum width: 0.30 km Max. effective width: 0.30 km
 Maximum depth: 9.2 m Mean depth: 2.02 m
 Shore length: 1.93 km Shoreline development: 1.68
 Lake volume: 210. x 10³ m³ Flushing rate: 6.29 x/year
 Basin permanence index: 0.11
 Inlets: Outlet:

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
				C42

Access: road, trail, water; remote, transitional, ready

Developments: Dam

Map Code: A.P. A23309-80

Table 41. Surface area, stratum interface areas, stratum volumes and total volume of Cann's Lake (C42b), Cape Breton Highlands National Park, Nova Scotia.

Cann's Lake C42b

Depth meters	Area		Stratum meters	Volume	
	Hectares	% of total		m ³ x 10 ³	% of total
0	10.4	100.	0-1	84.3	40.2
1	6.6	63.5	1-2	53.6	25.6
2	4.2	40.4	2-3	35.8	17.1
3	3.0	28.9	3-4	19.7	9.4
4	1.1	10.6	4-5	8.9	4.2
5	0.7	6.7	5-6	4.9	2.3
6	0.3	2.9	6-7	1.9	0.9
7	0.1	1.0	7-8	0.5	0.2
8	0.01	0.1	8-9	0.1	0.04
9	0.01	0.1	9-9.2	0.1	0.01
Mean depth = 2.02m			Total	209.7	

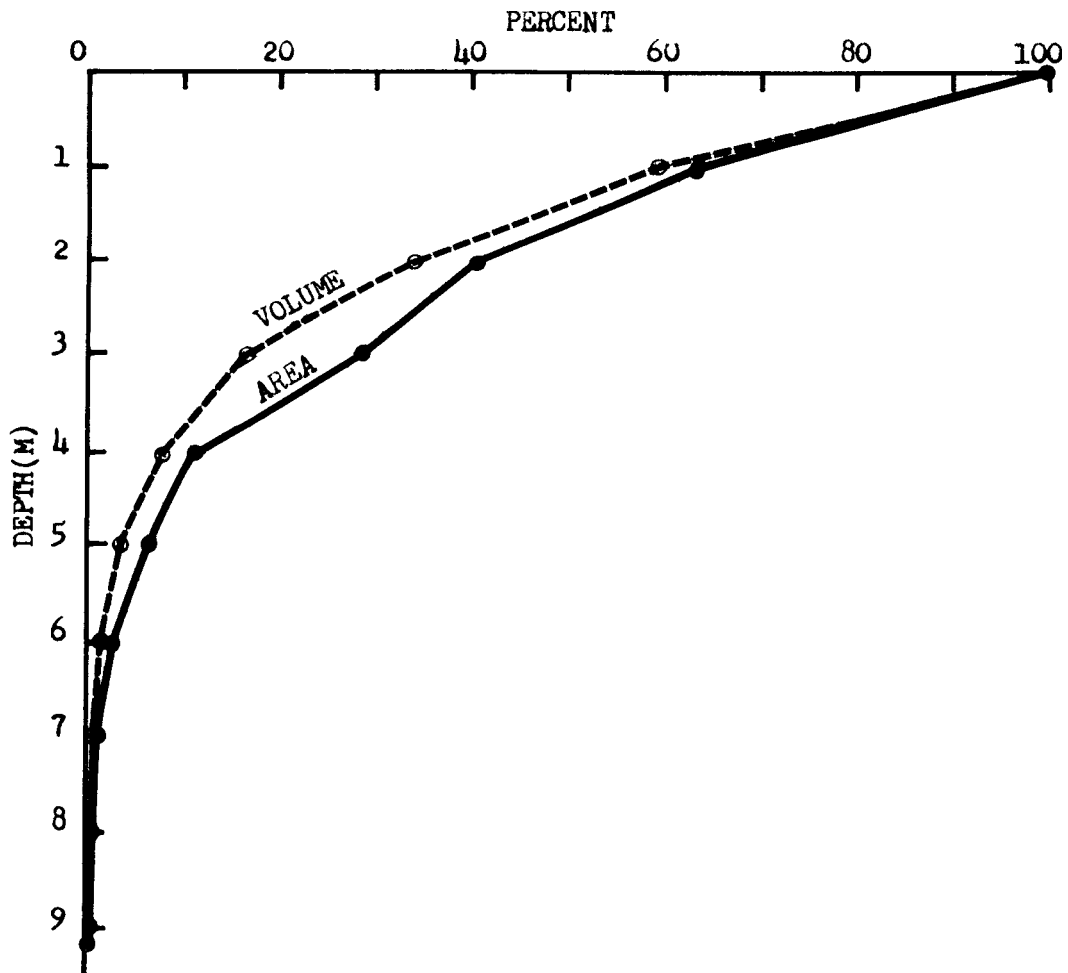


Figure 32. Area and volume depth curves, Cann's Lake (Cl2b), Cape Breton Highlands National Park, Nova Scotia.

Figure 33. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Cann's Lake, C42b, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: July 13, 1976
Elevation: 215 m
Surface area: 10.4 ha
Mean depth: 2.0 m
Flushing rate: 6.3/yr
Water retention: 0.16 yr.
Index of basin permanence: 0.11



Cann's Lake
C 42 b

Contours in meters
↑ Direction of Flow
+ Deep Station



Meters

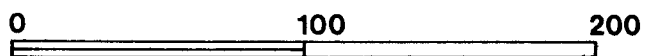


Table 42. MacDougall's Lake, C43a. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

MacDougall's Lake Drainage reference # C43a
 Lat. 46° 40' 20" Long. 60° 26' 24"
 UTM grid: _____
 Elevation: 800 ft 245 m Air distance from sea: 2.5 km
 Drainage system: _____ Reference # C43
 Drainage system area: 2.33 km²
 Total lake drainage area: 1.03 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 5.0 hectares Island area: _____ hectares
 Water surface area: 5.0 hectares No. of islands: 0
 Maximum length: 0.28 km Max. effective length: 0.28 km
 Maximum width: 0.24 km Max. effective width: 0.24 km
 Maximum depth: 11.5 m Mean depth: 3.40 m
 Shore length: 1.02 km Shoreline development: 1.02
 Lake volume: 170. x 10³ m³ Flushing rate: 9.7 x/year
 Basin permanence index: 0.16

Inlets:

Outlet:

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
				C43

C43

Access: road, trail, water; remote, transitional, ready

Developments:

dam

Table 43. Surface area, stratum interface areas, stratum volumes and total volume of MacDougall's Lake (C43a), Cape Breton Highlands National Park, Nova Scotia.

MacDougall's Lake C43a

Depth		Area		Stratum	Volume	
meters	Hectares	% of total		meters	$m^3 \times 10^3$	% of total
0	5.0	100.		0-1	44.4	26.1
1	3.9	78.2		1-2	33.8	19.9
2	2.9	57.7		2-3	25.5	15.0
3	2.2	44.4		3-4	19.9	11.7
4	1.8	35.2		4-5	15.8	9.3
5	1.4	28.3		5-6	12.6	7.4
6	1.1	22.3		6-7	8.8	5.2
7	0.7	14.8		7-8	4.9	2.9
8	0.3	5.3		8-9	2.4	1.4
9	0.2	3.0		9-10	1.2	0.7
10	0.1	1.5		10-11	0.5	0.3
11	0.03	0.5		11-11.5	0.1	0.04
Mean depth = 3.40m				Total	<u>170.0</u>	

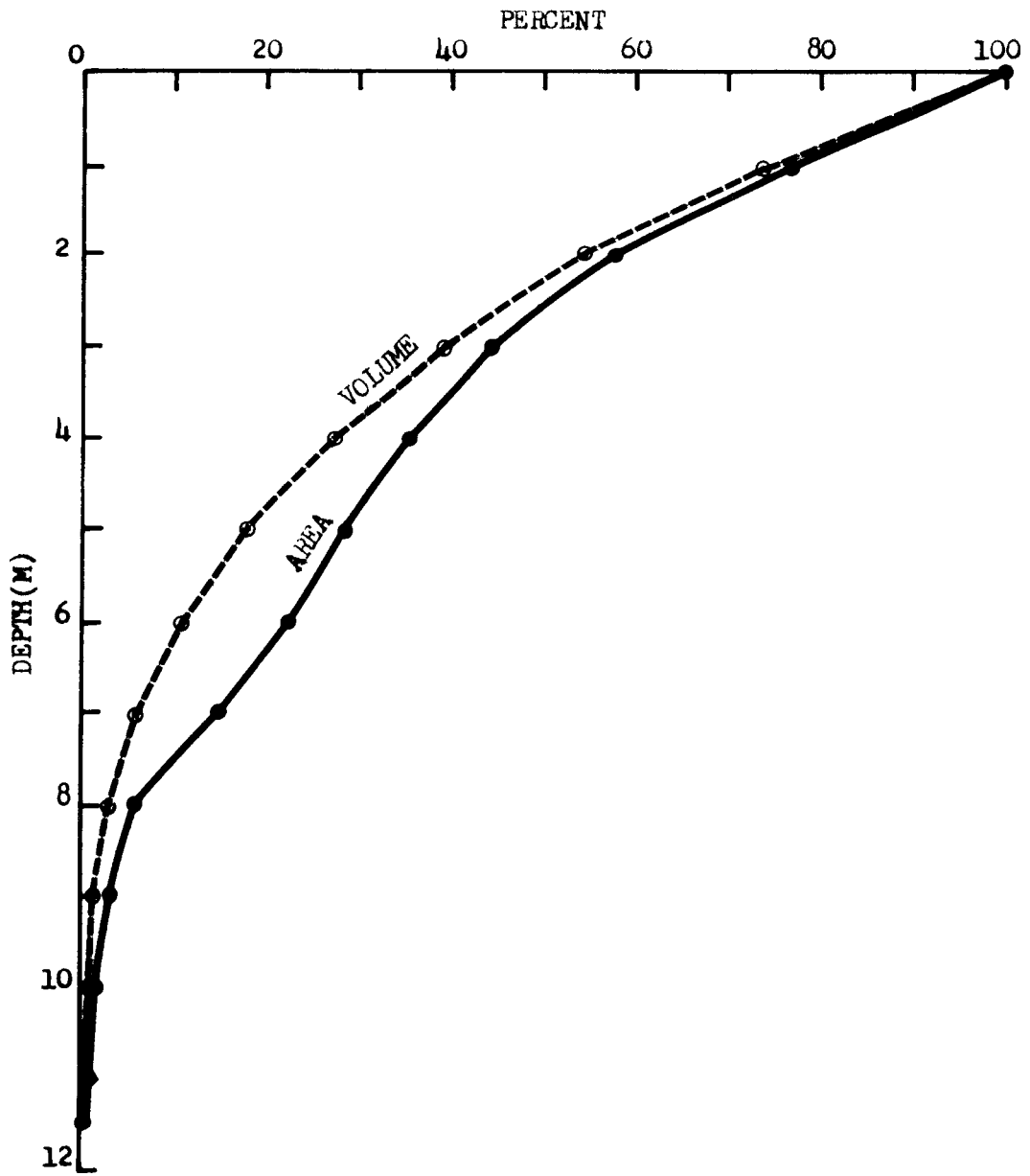
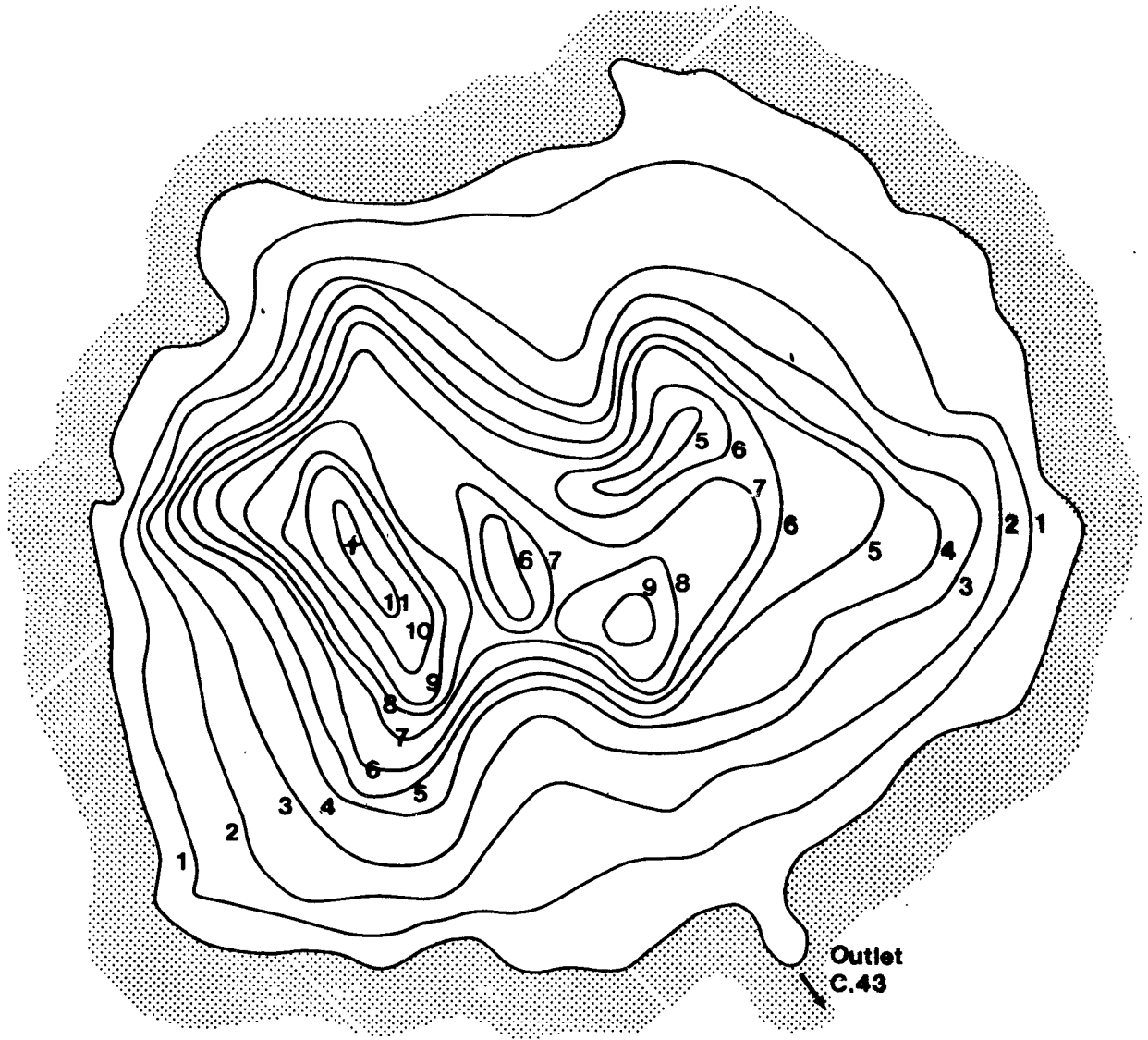


Figure 34. Area and volume depth curves, MacDougall's Lake (C43a), Cape Breton Highlands National Park, Nova Scotia.

Figure 35. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of MacDougall's Lake, C43a, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: July 13, 1976
Elevation: 245m
Surface area: 5.0 ha
Mean depth: 3.4m
Flushing rate: 9.7/yr
Water retention: 0.10 yr.
Index of basin permanence: 0.16



**MacDougall's Lake
C.43 a**

Contours in meters
↑ Direction of Flow
+ Deep Station

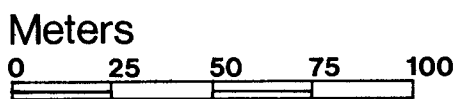


Table 44. Two Island Lake, Ch4.8a. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Two Island Lake Drainage reference # Ch4.8a
 Lat. 46° 39' 35" Long. 60° 35' 10"
 UTM grid: _____
 Elevation: 1550 ft 470 m Air distance from sea: 12.0 km
 Drainage system: Clyburn Brook Reference # Ch4
 Drainage system area: 43.5 km²
 Total lake drainage area: 1.03 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 27.0 hectares Island area: 1.4 hectares
 Water surface area: 25.6 hectares No. of islands: 2+
 Maximum length: 0.70 km Max. effective length: 0.64 km
 Maximum width: 0.66 km Max. effective width: 0.63 km
 Maximum depth: 5.5 m Mean depth: 1.42 m
 Shore length: 3.18 km Shoreline development: 1.77
 Lake volume: 362. x 10³ m³ Flushing rate: 0.09 x/year
 Basin permanence index: 0.11
 Inlets: _____ Outlet: _____

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
South Clyburn Brook	Ch4.8		South Clyburn Bk.	Ch4.8

Access: road, trail, water; remote, transitional, ready

Developments:

Map Code: A.P. A23309-73

Table 45. Surface area, stratum interface areas, stratum volumes and total volume of Two Island Lake (C44.8a), Cape Breton Highlands National Park, Nova Scotia.

Two Island Lake C44.8a

Depth	Area		Stratum	Volume	
meters	Hectares	% of total	meters	m ³ x 10 ³	% of total
0	25.6	100.	0-1	203.8	56.2
1	15.6	61.1	1-2	117.5	32.4
2	8.3	32.4	2-3	36.2	10.0
3	0.5	2.0	3-4	3.5	1.0
4	0.2	0.8	4-5	1.4	0.4
5	0.1	0.3	5-5.5	0.1	0.03
Mean depth = 1.42m			Total	<u>362.6</u>	

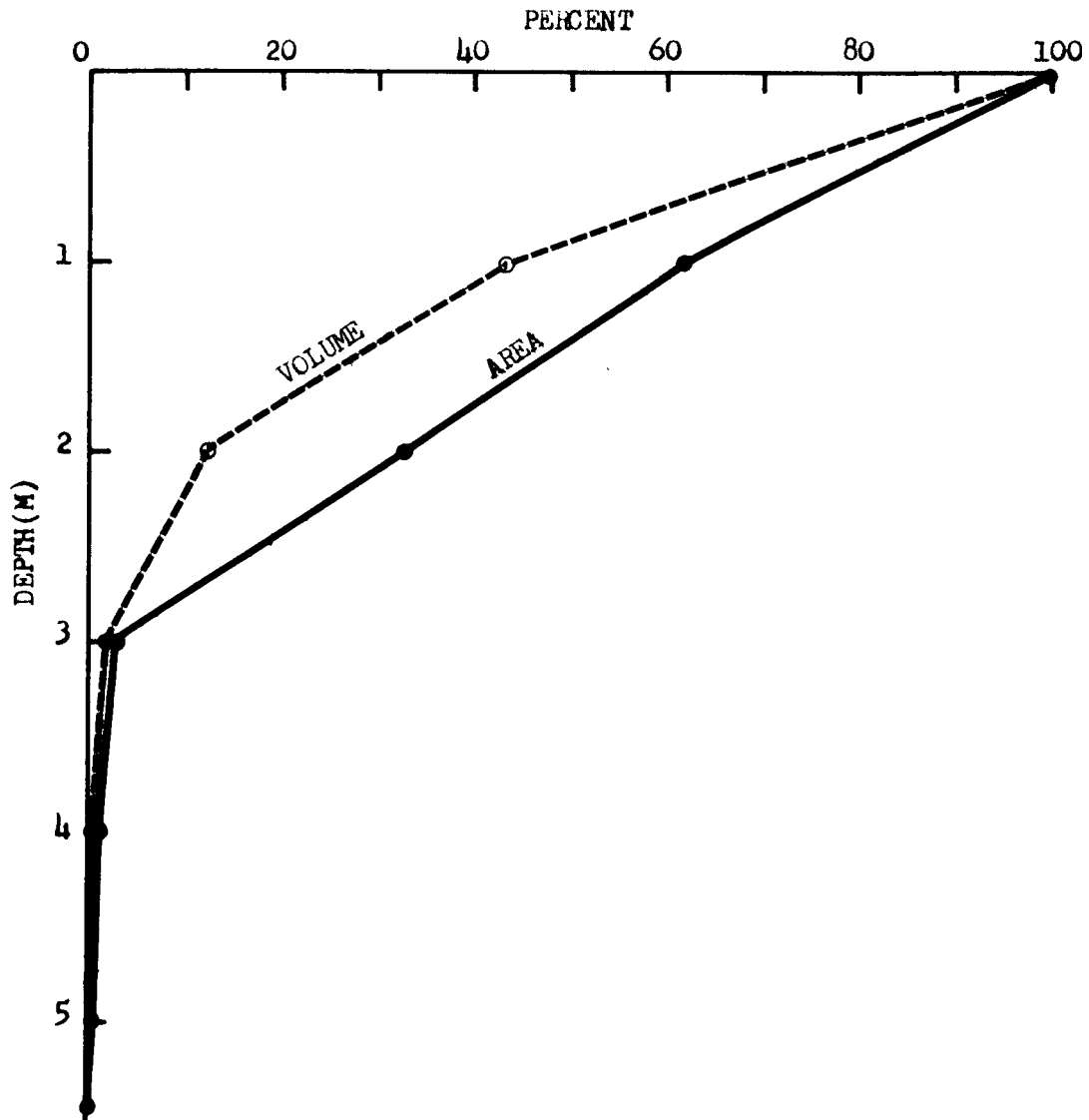


Figure 36. Area and volume depth curves,
Two Island Lake (C44.8a), Cape Breton
Highlands National Park, Nova Scotia.

Figure 37. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Two Island Lake, Clt.8a, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: Aug. 12, 1976

Elevation: 470 m

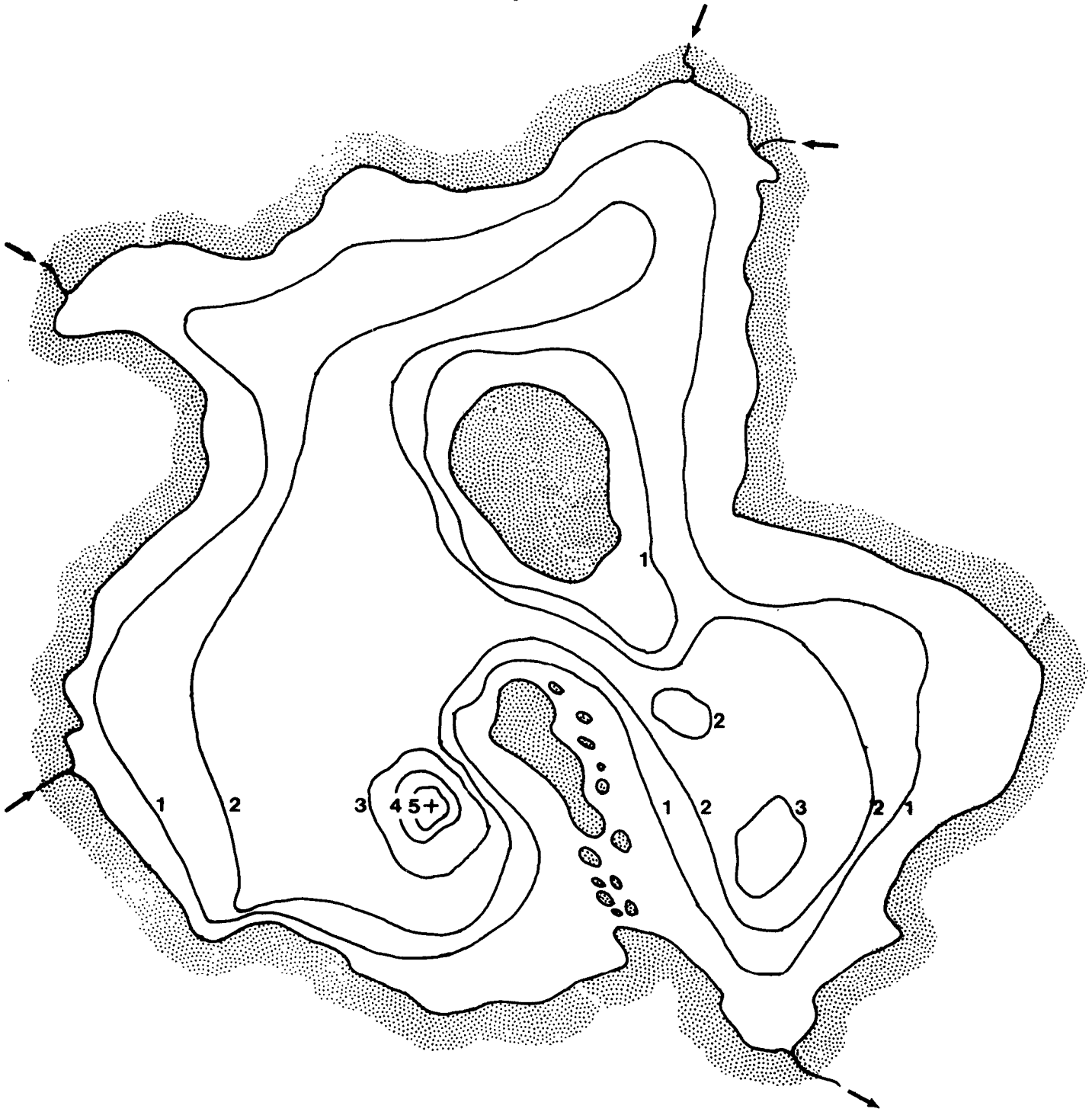
Surface area: 25.7 ha

Mean depth: 1.4 m

Flushing rate: 8.1/yr

Water retention: 0.12 yr.

Index of basin permanence: 0.11



**Two Island Lake
C 44.8a**

Contours in meters
↑ Direction of Flow
+ Deep Station



Meters



Table 46. Freshwater Lake, C45a. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Freshwater Lake Drainage reference # C45a
 Lat. 46° 38' 40" Long. 60° 23' 45"
 UTM grid: 990687
 Elevation: 0 ft 0 m Air distance from sea: 0.4 km
 Drainage system: Freshwater Lake Reference # C45
 Drainage system area: 3.4 km²
 Total lake drainage area: 3.4 km²
 Lake drainage area outside park: 0.62 km² = 18.2 % of total
 Lake area: 42.8 hectares Island area: 0.6 hectares
 Water surface area: 42.2 hectares No. of islands: 4
 Maximum length: 1.15 km Max. effective length: 1.15 km
 Maximum width: 0.74 km Max. effective width: 0.74 km
 Maximum depth: 16. m Mean depth: 6.49 m
 Shore length: 4.1 km Shoreline development: 1.79
 Lake volume: 2737. x 10³ m³ Flushing rate: 1.99 x/year
 Basin permanence index: 0.67

Inlets:		Outlet:	
<u>Name</u>	<u>Reference #</u>	<u>Name</u>	<u>Reference #</u>
	<u>C45</u>		<u>C45</u>

Access: road, trail, water; remote, transitional, ready

Developments: Park HQ, highway, beach, commercial & residential areas.

Map Code: A.P. A23309-23

Table 47. Surface area, stratum interface areas, stratum volumes and total volume of Freshwater Lake (C45a), Cape Breton Highlands National Park, Nova Scotia.

Freshwater Lake C45a

Depth meters	Area		Stratum meters	Volume	
	Hectares	% of total		m ³ x 10 ³	% of total
0	42.2	100.	0-1	398.3	14.6
1	37.5	89.0	1-2	352.8	12.9
2	33.1	78.6	2-3	309.3	11.3
3	28.8	68.5	3-4	268.8	9.8
4	25.0	59.2	4-5	231.3	8.4
5	21.3	50.5	5-6	201.4	7.4
6	19.0	45.0	6-7	181.4	6.6
7	17.3	41.0	7-8	164.4	6.0
8	15.6	37.0	8-9	146.6	5.4
9	14.4	34.2	9-10	133.9	4.9
10	12.4	29.3	10-11	114.4	4.2
11	10.5	25.0	11-12	94.5	3.4
12	8.4	20.0	12-13	71.5	2.6
13	6.0	14.1	13-14	45.0	1.6
14	3.2	7.6	14-15	20.2	0.7
15	1.0	2.5	15-16	3.5	0.1
Mean depth = 6.49m			Total	2737.3	

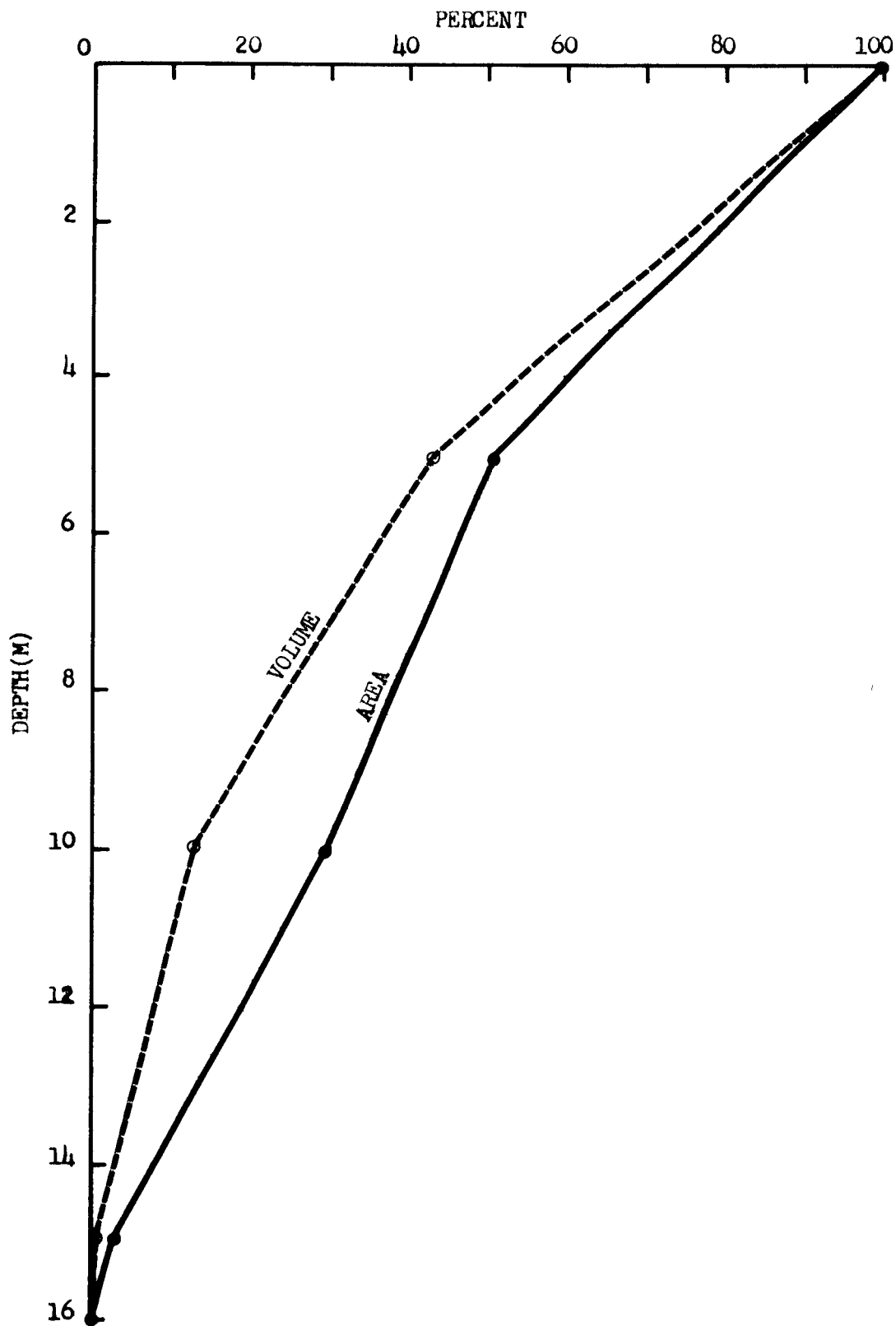
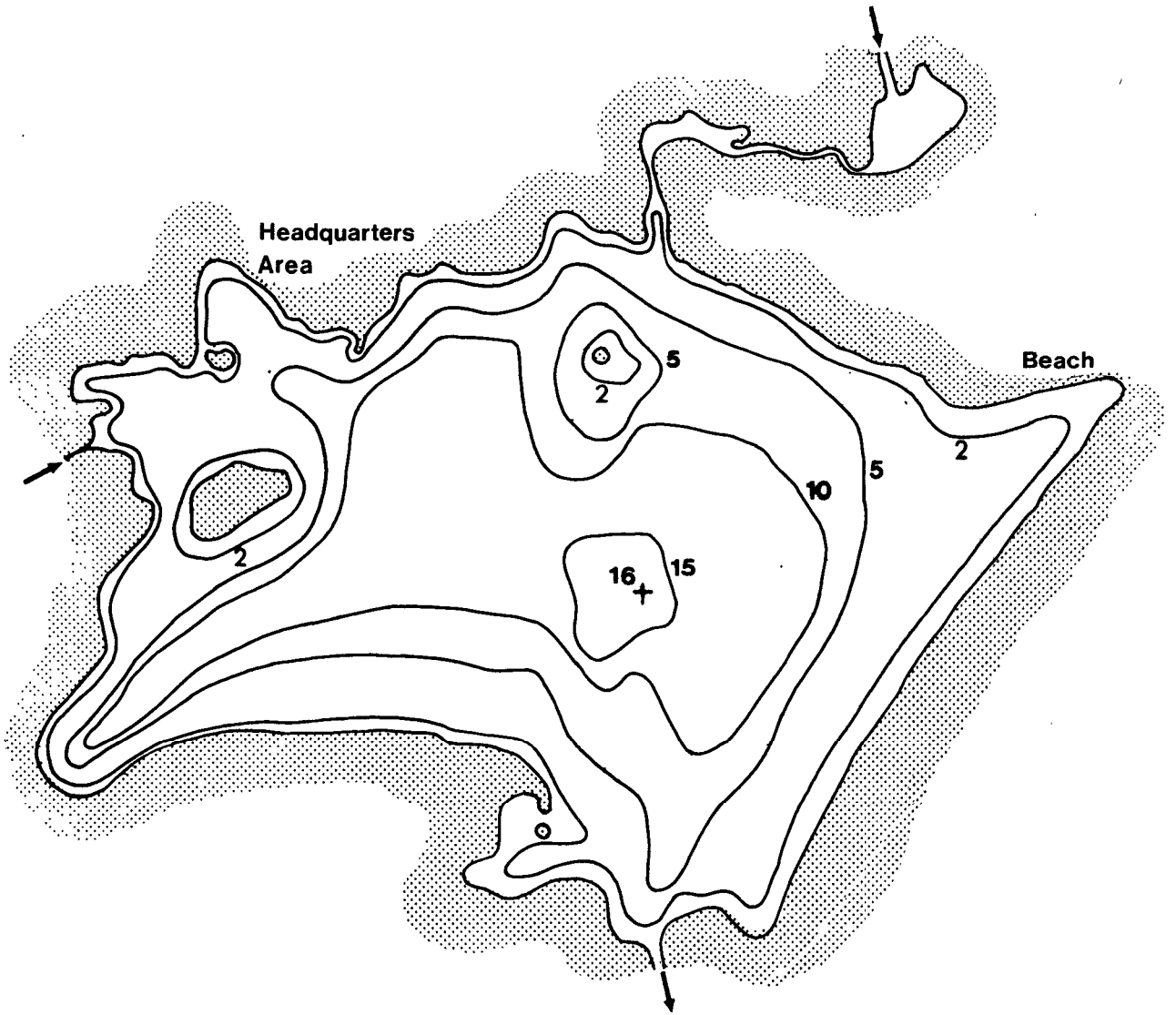


Figure 38. Area and volume depth curves, Freshwater Lake (Q45a), Cape Breton Highlands National Park, Nova Scotia.

Figure 39. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Freshwater Lake, C45a, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: 1966
Elevation: 3 m
Surface area: 42.2 ha
Mean depth: 6.5 m
Flushing rate: 2.0/yr
Water retention: 0.50 yr.
Index of basin permanence: 0.67



**Freshwater Lake
C 45 a**

Contours in meters
↑ Direction of Flow
+ Deep Station

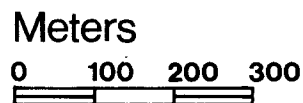


Table 48. Benjie's Lake, W22.2a. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Benjie's Lake Drainage reference # W22.2a
 Lat. 46° 44' 25" Long. 60° 48' 32"
 UTM grid: _____
 Elevation: 1350ft 410m Air distance from sea: 7.7 km
 Drainage system: MacKenzie River Reference # W22
 Drainage system area: 46.2 km²
 Total lake drainage area: 0.65 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 3.3 hectares Island area: _____ hectares
 Water surface area: 3.3 hectares No. of islands: 0
 Maximum length: 0.28 km Max. effective length: 0.28 km
 Maximum width: 0.15 km Max. effective width: 0.15 km
 Maximum depth: 0.71 m Mean depth: 0.49 m
 Shore length: 0.76 km Shoreline development: 1.18
 Lake volume: 16.3 x 10³ m³ Flushing rate: 63.7 x/year
 Basin permanence index: 0.02
 Inlets: Outlet:

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
W22.2				W22.2

Access: road, trail, water; remote, transitional, ready

Developments:

Map Code: A.P. A23309-168

Table 49. Surface area, stratum interface areas, stratum volumes and total volume of Benjie's Lake (W22.2a), Cape Breton Highlands National Park, Nova Scotia.

Benjie's Lake W22.2a

Depth meters	Area		Stratum meters	Volume	
	Hectares	% of total		m ³ x 10 ³	% of total
0	3.3	100.	0-.5	14.2	87.0
.5	2.4	72.7	.5-.6	1.5	9.2
.6	0.7	21.2	.6-.7	0.6	3.7
.7	0.5	15.2	.7-.71	0.02	0.1
Mean depth = 0.49m			Total	<u>16.32</u>	

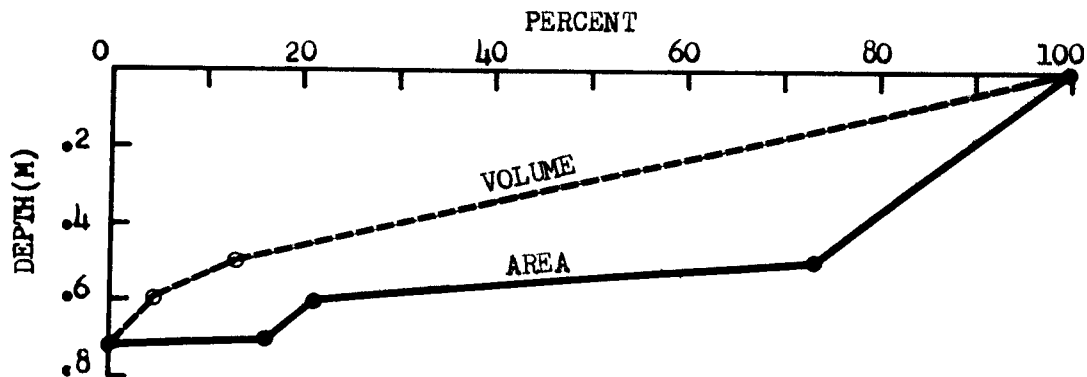
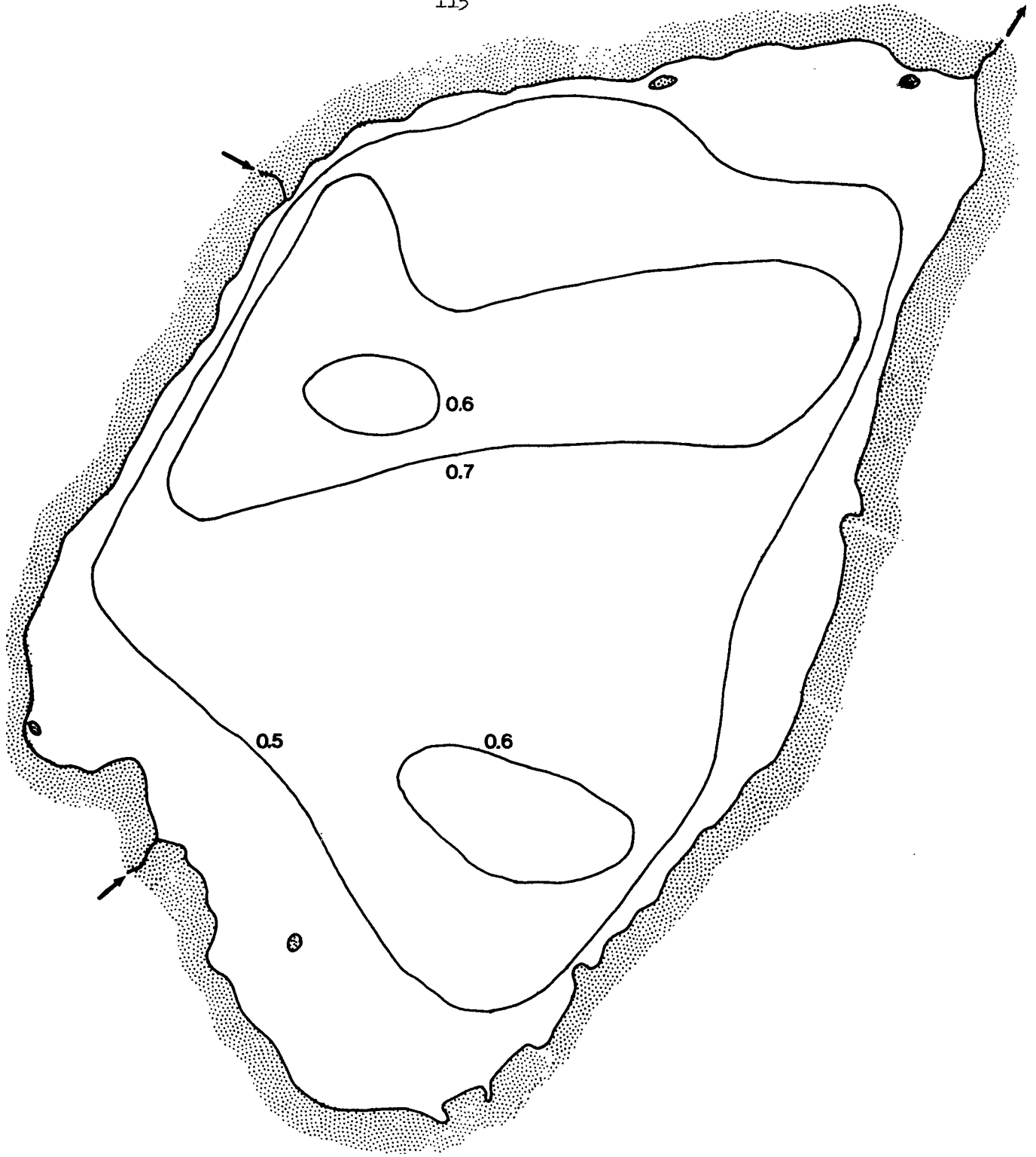


Figure 40. Area and volume depth curves, Benjie's Lake (W22.2a), Cape Breton Highlands National Park, Nova Scotia.

Figure 41. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Benjie's Lake, W22.2a, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: March 3, 1976
Elevation: 410 m
Surface area: 3.3 ha
Mean depth: 0.49 m
Flushing rate: 64/yr
Water retention: 0.016 yr.
Index of basin permanence: 0.02



Benjie's Lake
W22 2a

Contours in meters
↑ Direction of Flow



Table 50. Fishing Cove Lake, W24a. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Fishing Cove Lake Drainage reference # W24a
 Lat. 46° 42' 33" Long. 60° 49' 40"
 UTM grid: _____
 Elevation: 1450 ft 440 m Air distance from sea: 7.8 km
 Drainage system: Fishing Cove River Reference # W24
 Drainage system area: 18.5 km²
 Total lake drainage area: 1.25 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 2.43 hectares Island area: _____ hectares
 Water surface area: 2.43 hectares No. of islands: 0
 Maximum length: 0.31 km Max. effective length: 0.31 km
 Maximum width: 0.14 km Max. effective width: 0.14 km
 Maximum depth: 0.84 m Mean depth: 0.56 m
 Shore length: 0.80 km Shoreline development: 1.45
 Lake volume: 13.7 x 10³ m³ Flushing rate: 146. x/year
 Basin permanence index: 0.02
 Inlets: Outlet:

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
Fishing Cove R.	W24		Fishing Cove R.	W24

Access: road, trail, water; remote, transitional, ready

Developments:

Map Code: S.M. CB108(d)

Table 51. Surface area, stratum interface areas, stratum volumes and total volume of Fishing Cove Lake (W24a), Cape Breton Highlands National Park, Nova Scotia.

Fishing Cove Lake W24a

Depth meters	Area		Stratum meters	Volume	
	Hectares	% of total		m ³ x 10 ³	% of total
0	2.4	100.	0-0.5	10.6	77.6
0.5	1.8	75.1	0.5-0.6	1.7	12.3
0.6	1.6	63.5	0.6-0.7	1.1	7.8
0.7	0.7	26.7	0.7-0.8	0.3	2.2
0.8		2.3	0.8-0.84	0.01	0.1
Mean depth = 0.56m			Total	13.7	

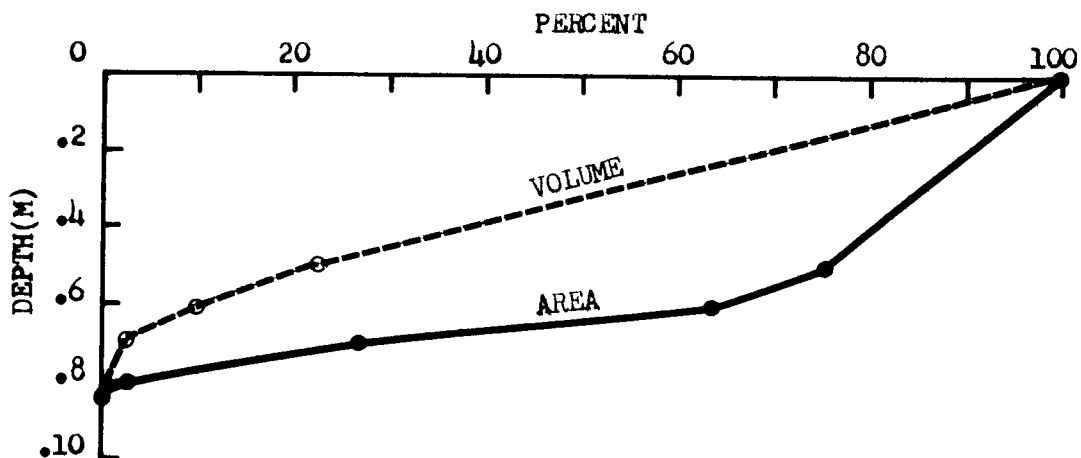
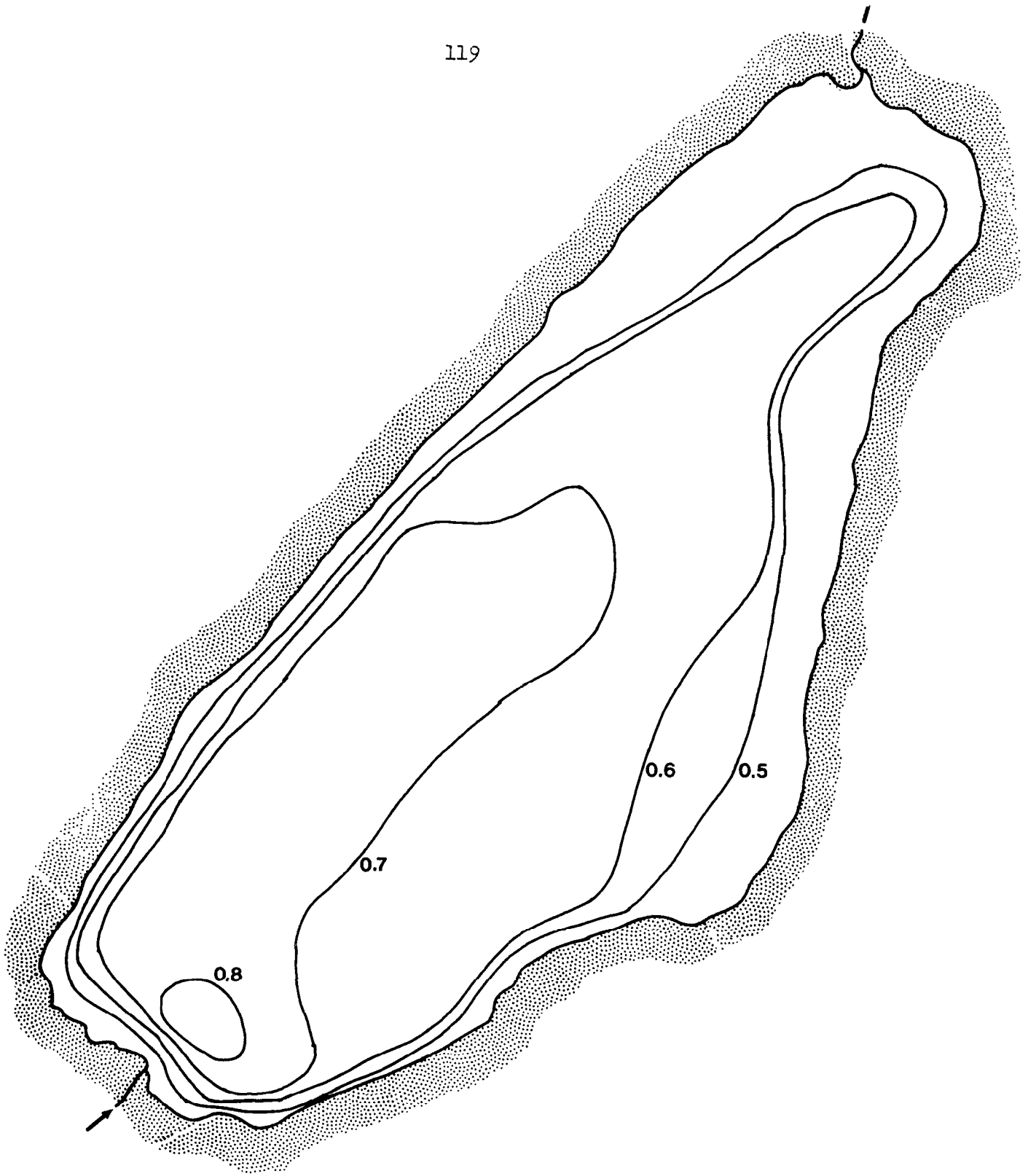


Figure 42. Area and volume depth curves, Fishing Cove Lake (W24a), Cape Breton Highlands National Park, Nova Scotia.

Figure 43. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of Fishing Cove Lake, W24a, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: March 4, 1976
Elevation: 440 m
Surface area: 2.4 ha
Mean depth: 0.56 m
Flushing rate: 146/yr
Water retention: 0.007 yr.
Index of basin permanence: 0.02



**Fishing Cove Lake
W 24 a**

Contours in meters
↑ Direction of Flow



Meters

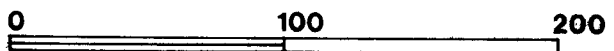


Table 52. French Lake, W30.6a. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

French Lake Drainage reference # W30.6a
 Lat. 46° 43' 45" Long. 60° 51' 50"
 UTM grid: 631770
 Elevation: 1400 ft 430 m Air distance from sea: 4.2 km
 Drainage system: Corney Brook Reference # W30
 Drainage system area: 38.1 km²
 Total lake drainage area: 0.55 km²
 Lake drainage area outside park: km² = % of total
 Lake area: 7.05 hectares Island area: hectares
 Water surface area: 7.05 hectares No. of islands: 0
 Maximum length: 0.58 km Max. effective length: 0.58 km
 Maximum width: 0.21 km Max. effective width: 0.21 km
 Maximum depth: 2.0 m Mean depth: 1.04 m
 Shore length: 1.44 km Shoreline development: 1.53
 Lake volume: 73.4 x 10³ m³ Flushing rate: 12.0 x/year
 Basin permanence index: 0.05

Inlets:

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
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W30.6

Access: road, trail, water; remote, transitional, ready

Developments: Highway

Map Code: A.P. A23309-165

Table 53. Surface area, stratum interface areas, stratum volumes and total volume of French Lake (W30.6a), Cape Breton Highlands National Park, Nova Scotia.

French Lake W30.6a

Depth meters	Area		Stratum meters	Volume	
	Hectares	% of total		m ³ x 10 ³	% of total
0	7.0	100.	0-0.5	31.5	42.9
0.5	5.6	79.1	0.5-1.0	24.7	33.7
1.0	4.3	61.4	1.0-1.5	13.3	18.1
1.5	1.3	18.1	1.5-2.0	3.8	5.2
2.0	0.3	4.8	2.0-2.1	0.1	0.1
Mean depth = 1.04m			Total	73.4	

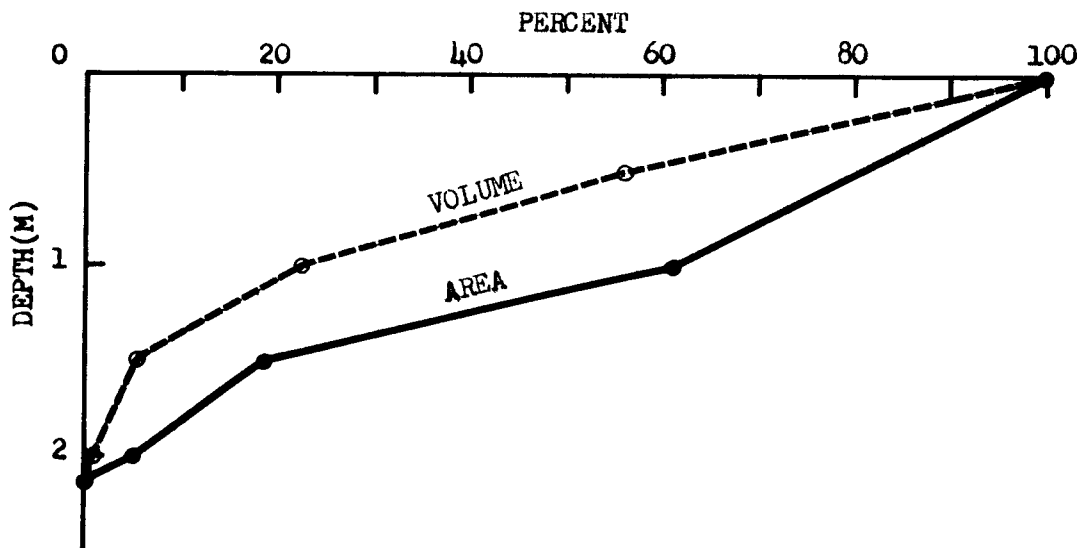
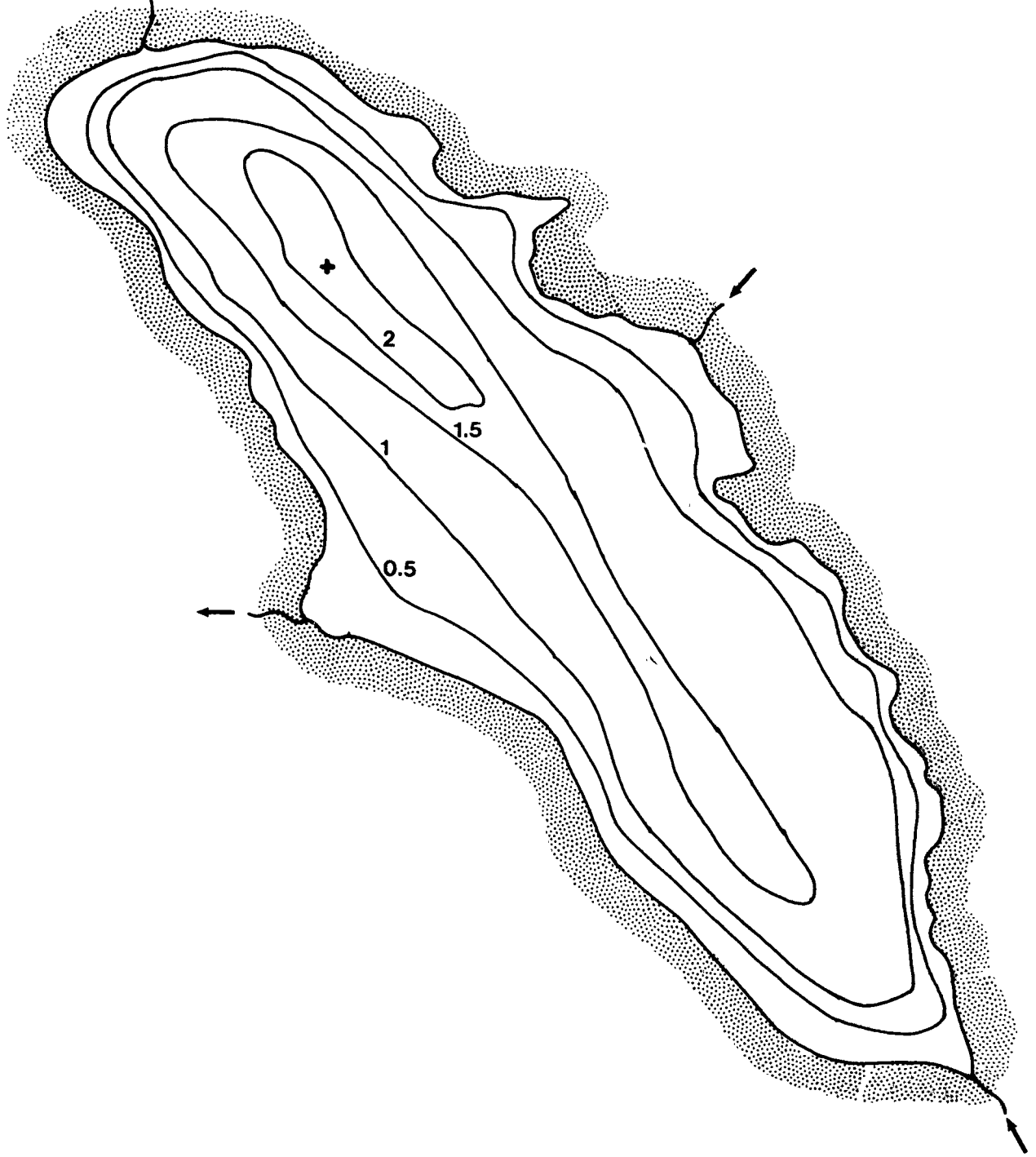


Figure 44. Area and volume depth curves, French Lake (W30.6a), Cape Breton Highlands National Park, Nova Scotia.

Figure 45. Bathymetric map, date of sounding, geodetic elevation and selected morphometric features of French Lake, W30.6a, Cape Breton Highlands National Park, Nova Scotia.

Date of sounding: April 9, 1973
Elevation: 430 m
Surface area: 7.0 ha
Mean depth: 1.0 m
Flushing rate: 12/yr
Water retention: 0.08 yr.
Index of basin permanence: 0.05

Cabot Trail



**French Lake
W 30.6a**

Contours in meters
↑ Direction of Flow
+ Deep Station



Meters

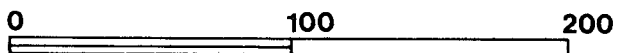


Table 54. Little Presqu'ile Lake, W32a. Cape Breton Highlands National Park.

Lake Drainage and Morphometry

Little Presqu'ile Lake Drainage reference # W32a
 Lat. 46° 41' 25" Long. 60° 57' 25"
 UTM grid: _____
 Elevation: 50 ft 5 m Air distance from sea: 0.1 km
 Drainage system: Presqu'ile Brook Reference # W32
 Drainage system area: 1.20 km²
 Total lake drainage area: 1.20 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 0.5 hectares Island area: _____ hectares
 Water surface area: 0.5 hectares No. of islands: 0
 Maximum length: 0.11 km Max. effective length: 0.11 km
 Maximum width: 0.06 km Max. effective width: 0.06 km
 Maximum depth: 3.0 m Mean depth: 1.49 m
 Shore length: 0.29 km Shoreline development: 1.16
 Lake volume: 9.70 x 10³ m³ Flushing rate: 263. x/year
 Basin permanence index: 0.03
 Inlets: Outlet:

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
	<u>W32</u>			<u>W32</u>

Access: road, trail, water; remote, transitional, ready

Developments: Highway

Map Code: S.M. CB107(d)

Table 55. Surface area, stratum interface areas, stratum volumes and total volume of Little Presqu'ile Lake (W32a), Cape Breton Highlands National Park, Nova Scotia.

Little Presqu'ile Lake W32a

Depth meters	Area		Stratum meters	Volume	
	Hectares	% of total		m ³ x 10 ³	% of total
0	0.5	100.	0-1	3.9	52.9
1	0.3	60.0	1-2	2.3	31.1
2	0.2	34.7	2-3	1.2	15.9
3	0.1	14.7			
Mean depth = 1.49m			Total	7.3	

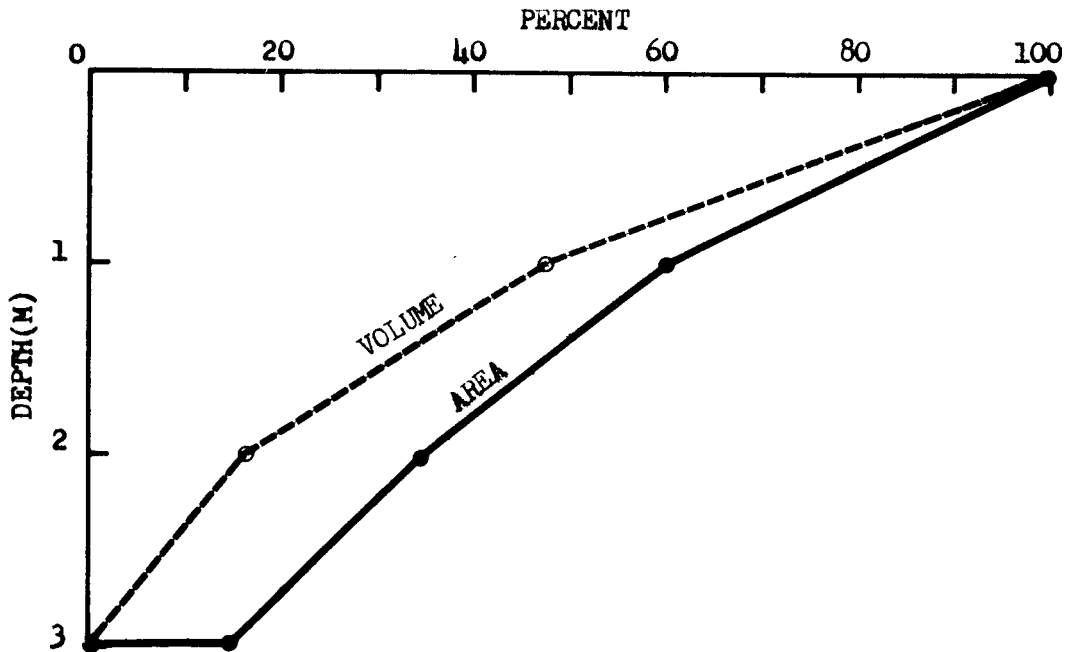


Figure 46. Area and volume depth curves, Little Presqu'ile Lake (W32a), Cape Breton Highlands National Park, Nova Scotia.

Table 56. Presqu'ile Lake, W32b. Cape Breton highlands National Park.

Lake Drainage and Morphometry

Presqu'ile Lake Drainage reference # W32b
 Lat. 46° 41' 20" Long. 60° 57' 10"
 UTM grid: 561725
 Elevation: <50 ft 5 m Air distance from sea: 0.2 km
 Drainage system: Presqu'ile Reference # W32
 Drainage system area: 1.20 km²
 Total lake drainage area: 0.85 km²
 Lake drainage area outside park: _____ km² = _____ % of total
 Lake area: 4.36 hectares Island area: _____ hectares
 Water surface area: 4.36 hectares No. of islands: 0
 Maximum length: 0.67 km Max. effective length: 0.67 km
 Maximum width: 0.10 km Max. effective width: 0.10 km
 Maximum depth: 3.0 m Mean depth: 2.1 m
 Shore length: 1.52 km Shoreline development: 2.05
 Lake volume: 92.7 x 10³ m³ Flushing rate: 14.7 x/year
 Basin permanence index: 0.06
 Inlets: _____ Outlet: _____

<u>Name</u>	<u>Reference #</u>	<u>Drainage area km²</u>	<u>Name</u>	<u>Reference #</u>
				<u>W32</u>

Access: road, trail, water; remote, transitional, ready

Developments: highway

Map Code: S.M. CBL07(d)

Table 57. Surface area, stratum interface areas, stratum volumes and total volume of Presqu'ile Lake (W32b), Cape Breton Highlands National Park, Nova Scotia.

Presqu'ile Lake

Depth meters	Area		Stratum meters	Volume	
	Hectares	% of total		m ³ x 10 ³	% of total
0	4.4	100.0	0-1	41.0	44.2
1	3.8	88.2	1-2	34.0	36.7
2	3.0	68.0	2-3	17.7	19.1
3	0.8	18.4			

Mean depth = 2.13m

Total 92.7

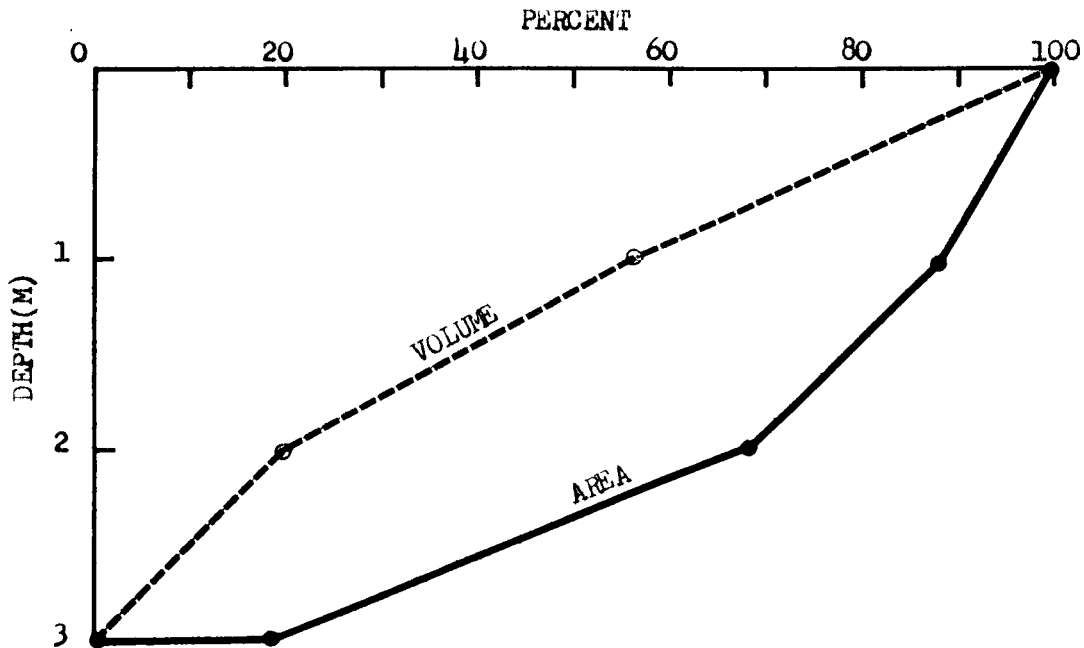


Figure 47. Area and volume depth curves, Presqu'ile Lake (W32b), Cape Breton Highlands National Park, Nova Scotia.

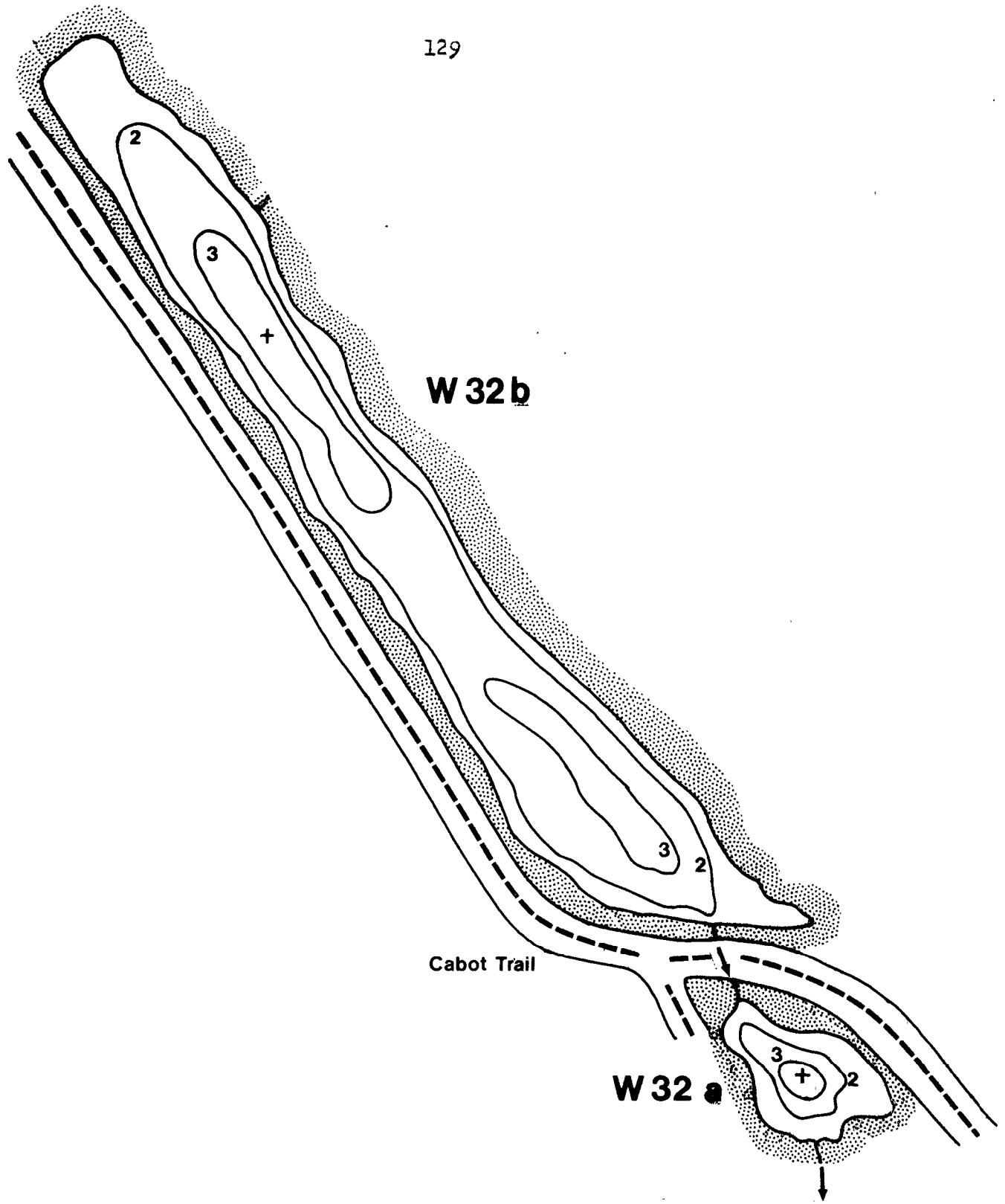
Figure 48. Bathymetric maps, date of sounding, geodetic elevation and selected morphometric features of Little Presqu'ile L'k, W32a, and Presqu'ile Lake, W32b, Cape Breton Highlands National Park, Nova Scotia.

Little Presqu'ile Lake, W32a:

Dates of sounding: June 23, 1947
July 9, 1976
Elevation: 2 m
Mean depth: 1.5 m
Flushing rate: 263/yr
Water retention: 0.004 yr
Index of basin permanence: 0.03

Presqu'ile Lake, W32b:

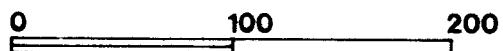
Dates of sounding: June 23, 1947
July 9, 1976
Elevation: 2 m
Surface area: 4.4 ha
Mean depth: 2.1 m
Flushing rate: 15/yr
Water retention: 0.07 yr
Index of basin permanence: 0.06



Little Presqu'île Lake
W 32 a
Presqu'île Lake
W 32 b

Contours in meters
↑ Direction of Flow
+ Deep Station

Meters



DISCUSSION

The lakes investigated vary widely in size, ranging from bog ponds of a few hundred square meters surface area and less than one meter deep (e.g. Bog Exhibit Pond, W24.8.1a, and Bog South Pond, W24.8.1c) to Warren Lake with an area of 90 hectares and a mean depth of 16 meters. Among the 25 sounded lakes, 9 had less than 1m mean depth, 13 had 1 to 5m mean depth, and only two (Freshwater Lake and Warren Lake) exceeded 5m mean depth (Table 5). Warren Lake had the greatest maximum depth of the Park lakes, reaching 31m near the west end of the lake.

Table 6 lists morphometric indices and hydrologic features calculated from morphometric features and distance of the lakes from the sea. The indices may be used to compare lakes in a more or less quantitative manner and some can give insight into the trophic status of a lake. The distance from the sea may explain some chemical differences among the lakes related to sea spray and aerosol influence.

The drainage ratio or relative basin size, $A':A$ gives the relationship between the total drainage area and the lake surface area. This index is closely associated with nutrient supply (Schindler, 1971; Kerekes, 1974) because, in a geologically and climatically uniform area, nutrient supply is largely a function of water input from the drainage basin. The drainage ratios of the 25 sounded lakes range from 5.3 (Glasgow Lake, C24g) to 240 (Little Presqu'ile Lake, W32a).

Flushing rate (FR) and its inverse relationship to water retention time (t_w), are dependent upon the drainage ratio, mean depth and mean annual moisture surplus (runoff). An increase in any or all of these factors will cause an increase in flushing rate and consequently a decrease in water

retention time. In an area where nutrient supply is not strongly influenced by human interference or differences in geology, the supply is almost solely a function of flushing rate because the influents into lakes carry similar concentrations of nutrients (Schwinghamer, 1975). Kerekes (1975) showed that the effects of increased nutrient supply attributed to high flushing rates are neutralized and that the concentrations of nutrients and biomass in lakes level off in cases where the flushing rate is more than about 10 times per year. Flushing rates among the 25 lakes for which data are available range from 1.9 in Glasgow Lake, C24g, ($t_w = 0.526$) to 263 in Little Presqu'ile Lake, W32a, ($t_w = 0.004$). These estimates do not take into account variations in the local micro climate among the drainage basins. Consequently, the values may not be accurate, especially for lakes on the highlands where the moisture surplus is undoubtedly higher than at lower elevations. Only by monitoring lake outlet streams can accurate flushing rates be obtained.

Hydraulic loading, q_s (Vollenweider, 1975; Dillon and Rigler, 1974), also called water discharge height, is the product of flushing rate times mean depth. It is an extremely useful parameter for estimating nutrient loading levels in undisturbed lakes. Vollenweider (1976) has plotted aerial total phosphorus loading against q_s in a large number of North American lakes and obtains a very good separation of oligotrophic from eutrophic lakes. The range of q_s among the lakes examined is from 8.4 $\mu\text{m}/\text{yr}$ (John Dee Lake, C23.1d5a) to 392.m/yr (Little Presqu'ile Lake, W32a). Because of their dependence on flushing rate values, the q_s values may have to be modified when more accurate flushing rates can be obtained.

The shore length to surface area ratio (L:A) depends not only on the

irregularity of the shoreline but also on the size of the lake. It can be used as an index of the relative availability of littoral area in lakes (Rawson, 1960). Low L:A ratios infer that littoral benthic and macrophytic production would assume lesser importance compared to lakes with higher ratios. Errors in shore length measurement can be very serious and can limit the usefulness of shore length based indices, especially in small lakes. As expected, Little Presqu'ile Lake (W32a), the smallest lake measured, has the highest L:A ratio (58.0), while Warren Lake has the lowest (5.52).

Shoreline development (D_L) is also an index of shoreline irregularity. It is based on the lake's departure from a perfect circular form, which would give a D_L of 1.0, the lowest possible value for this index. Long, narrow lakes and highly irregular lakes with many islands have the highest D_L values. The lowest D_L value calculated was 1.02 for MacDougall's Lake (C43a) while the highest was 3.13 for Dundas #3 Lake (C41c).

The mean depth to maximum depth ratio ($\bar{z}:z_m$), multiplied by 3, gives the development of the volume. When the value of the $\bar{z}:z_m$ approaches 0.33 (or the development of the volume approached unity), the lake basin is close to the form of a cone whose height is the maximum depth of the lake and whose base is equal to the surface area of the lake. When the lake basin walls are convex toward the water, the $\bar{z}:z_m$ ratio is less than 0.33, and when the walls are concave the index is more than 0.33.

The value of L:A and D_L as indices of littoral development is limited because depth is not taken into account. Kerekes (1972) proposed a more meaningful morphometric index, dividing L:A by mean depth (\bar{z}) or more simply shore length:volume (L:V, Kerekes, 1974). The inverse of this ratio (V:L) is an index of basin permanence or BPI (Kerekes, 1975). A very

shallow, nearly extinct (filled up) lake would have a BPI near 0, while a large deep lake could have a BPI value greatly in excess of unity.

Kerekes (1975) suggested that a BPI of 0.1 or less indicates that the lake is near extinction, while a value of 0.2 or more indicates a more permanent lake. The lowest BPI value among the lakes examined was 0.02 in Dundas #5 Lake (C41d10a), Benjie's Lake (W22.2a) and Fishing Cove Lake (W24a). The highest BPI was that of Warren Lake (2.88). Fifteen of the 25 lakes sounded had BPI values of 0.1 or less (Table 6).

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APPENDIX

List of Aquatic Resources Inventory Reports, Cape Breton Highlands National Park, Nova Scotia:

- Part 1. Drainage Basin, Stream and Lake Catalogue.
- Part 2. Lake Drainage and Morphometry.
- Part 3. Selected Limnological Measurements in 62 Lakes.
- Part 4. Selected Limnological Measurements in Streams, Lake Inlets and Outlets.
- Part 5. Limnological Conditions.
- Part 6. Conclusions and Recommendations.

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